Report of the Committee on Specifications and Tolerances

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Reference
Key Number

300 INTRODUCTION

This is the final report of the Committee on Specifications and Tolerances (S&T) (Committee) for the 89th Annual Meeting of the National Conference on Weights and Measures (NCWM). The report is based on the 89th Interim Report offered in NCWM Publication 16, "Committee Reports," the Addendum Sheets issued at the Annual Meeting, and actions taken by the membership at the Voting Session of the Annual Meeting.

Table A identifies the agenda items in the report by Reference Key Number, Item Title, and Page Number. The item numbers are those assigned in the Interim Meeting Agenda. Voting items are indicated with a **"V,**" or if the item was part of the consent calendar by the suffix **"VC"** after the item number. Items marked with an **"I"** after the reference key numbers are information items. Items marked with a **"D"** after the key numbers are developing issues. The developing designation indicates an item that while it has merit, it may not be adequately developed for action at the national level. Developing items inform parties about issues that are developing in different localities or in the regional associations. A developing item is returned to the submitter to develop further before any action is taken at the national level. The Committee withdrew items marked with a **"W."** Items marked with a **"W"** generally will be referred to the regional weights and measures associations because they either need additional development, analysis, and input, or did not have sufficient Committee support to bring them before the NCWM. Table B lists the Appendices to the report, and Table C provides a summary of the results of the voting on the Committee's items and the report in entirety.

This Report contains many recommendations to revise or amend National Institute of Standards and Technology (NIST) Handbook 44 (HB-44), 2004 Edition, "Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices." Proposed revisions to the handbook(s) are shown in **bold face print** by **~~striking out~~** information to be deleted and **<u>underlining</u>** information to be added. Requirements that are proposed to be nonretroactive are printed in **bold-faced *italics.***

Note: The policy of NIST is to use metric units of measurement in all of its publications; however, recommendations received by the NCWM technical committees have been printed in this publication as they were submitted and may, therefore, contain references to inch-pound units.

Table A
Index to Reference Key Items

Reference Key Number		Title of Item	Page
300		**INTRODUCTION**	**1**
310		**GENERAL CODE**	**4**
310-1	I	G-S.1. Identification; Built-for-Purpose Software Based Devices, Table G-S.1. Identification, G-S.1.1. Location of Marking Information for Not Built For Purpose Software Based Devices, and Appendix D; Definition of Not-Built-for-Purpose Device	4
310-2	W	G-N.3. Compatibility of Indicators and Weighing or Measuring Elements	8
320		**SCALES**	**9**
320-1	V	S.1.12. Manual Gross Weight Entries and UR.3.9. Use of Manual Gross Weight Entries	9
320-2	W	S.6.4. Railway Track Scales	11
320-3	VC	Table S.6.3.a. Marking Requirements and Table S.6.3.b. Notes for Table S.6.3.a; Note 24 Section Capacity Prefix	13
320-4	VC	N.3.2. Field Standard Weight Carts	15
320-5	VC	N.1.5. Discrimination Test	16
320-6	VC	Table 3 Parameters for Accuracy Classes; Footnote 5 Grain Hopper Scales	16
320-7	W	Appendix D; Definition of Counter Scale, S.2.1.3. Scales Equipped with an Automatic Zero-Setting Mechanism, N.1.3.1. Bench or Counter Scales, and N.1.3.8. All Other Scales Except Crane Scales, Hanging Scales, Hopper Scales, Wheel-Load Weighers, and Portable Axle-Load Weighers	18
320-8	I	S.1.1. (c) Zero Indication; Requirements for Markings or Indications for Other than Digital Zero Indications	20
321		**BELT-CONVEYOR SCALE SYSTEMS**	**22**
321-1	VC	S.1.5. Rate of Flow Indicators and Recorders and UR.1. Use Requirements; Operated Capacity	22
321-2	VC	N.2. Conditions of Test, N.2.1. Initial Verification, N.2.2. Subsequent Verification, and N.2.3. Minimum Test Load	23
321-3	VC	N.3.1.2. Initial Stable Zero, N.3.1.3. Test of Zero Stability, and T.1.1. Tolerance Values-Test of Zero Stability	24
321-4	VC	N.3.1.4. Check For Consistency of the Conveyor Belt Along Its Entire Length	25
321-5	VC	T.3.1.1. Effect on Zero-Load Balance	26
321-6	VC	UR.2.2.(b) Conveyor Installation; Live Portions of Scale	27
321-7	VC	UR.3.2.(b) Maintenance	27
322		**AUTOMATIC BULK WEIGHING SYSTEMS**	**28**
322-1	I	Tolerances	28
324		**AUTOMATIC WEIGHING SYSTEMS**	**34**
324-1	V	Tentative Status of the Automatic Weighing Systems Code	34
330		**LIQUID-MEASURING DEVICES**	**35**
330-1	VC	S.2.2.1. Multiple Measuring Elements With a Single Provision for Sealing	35
330-2	VC	S.4.4.2. Location of Marking Information; Retail Motor-Fuel Dispensers	36
330-3	W	Table T.2. Accuracy Classes for Liquid Measuring Devices Table T.2. Accuracy Classes for Liquid Measuring Devices Covered in Section 3.30	38
330-4	W	UR.2.5. Product Identification	39
330-5	VC	Appendix D; Definition of Retail Device	40
331		**VEHICLE-TANK METERS**	**41**
331-1	V	Recognition of Temperature Compensation	41
331-2	I	N.4.2. Special Tests (Except Milk-Measuring Systems), N.4.5. Product Depletion Test, and T.5. Product Depletion Test	44
331-3	I	S.2.4. Zero Set-Back Interlock	47

332 LPG AND ANHYDROUS AMMONIA LIQUID-MEASURING DEVICES 48
332-1 W UR.2.3. Vapor-Return Line 48

358 MULTIPLE DIMENSION MEASURING DEVICES 49
358-1 VC S.1.6. Customer Indications and Recorded Representations, Table S.1.6. Required Information to be Provided by Multiple Dimension Measuring Systems, UR.5. Customer Information Provided, and Table UR.5. Customer Information to be Provided 49
358-2 VC S.1.8. Indications Below Minimum and Above Maximum and Table S.4.1.b. Notes for Table S.4.1.a.; Note 7 53
358-3 VC S.3. Systems with Two or More Measuring Elements and Definition of Measurement Field 54
358-4 VC N.1.4.1. Test Objects and Definition of Test Objects 56
358-5 VC T.3. Tolerance Values 57
358-6 VC T.5.2. Power Supply Voltage, T.5.2.1. Alternating Current Power Supply, and T.5.2.2. Direct Current Power Supply 58
358-7 VC Tentative Status of the Multiple Dimension Measuring Devices Code 59

360 OTHER ITEMS 60
360-1 W Revise NIST Handbook 44 60
360-2 I International Organization of Legal Metrology (OIML) Report 60
360-3 D Developing Issues 61
360-4 I Add International Terms that are Synonyms to NIST Handbook 44 Terms to Appendix D; Definitions 61

Table B
Appendices

Appendix	Title	Page
A	Item 360-3: Developing Issues	A1
B	Item 324-1: Tentative Status of the Automatic Weighing Systems Code	B1

Table C
Voting Results

Reference Key Number	House of State Representatives		House of Delegates		Results
	Yeas	Nays	Yeas	Nays	
300 (Consent Calendar)	All Yeas	No Nays	All Yeas	No Nays	Passed
320-1	35	1	34	1	Passed
324-1	36	0	35	0	Passed
331-1	19	15	19	14	Returned to Committee
300 (Report in its Entirety Voice Vote)	All Yeas	No Nays	All Yeas	No Nays	Passed

Details of all Items
(In order by Reference Key Number)

310 GENERAL CODE

310-1 I G-S.1. Identification; Built-for-Purpose Software Based Devices, Table G-S.1. Identification, G-S.1.1. Location of Marking Information for Not Built For Purpose Software Based Devices, and Appendix D; Definition of Not-Built-for-Purpose Device

Source: Carryover Item 310-1B.

Recommendation: Modify General Code paragraph G-S.1., delete paragraph G-S.1.1., renumber paragraph G-S.1.2., add new Table G-S.1., and add a new definition for "not-built-for-purpose device" to Appendix D as follows:

G-S.1. Identification. - All equipment, except weights and separate parts necessary to the measurement process, but not having any metrological effect, shall be clearly marked **in accordance with Table G-S.1.** for the purposes of identification, with the following information:

(a) the name, initials, or trademark of the manufacturer or distributor;

(b) a model designation that positively identifies the pattern or design of the device;

(c) the model designation shall be prefaced by the term "Model," "Type," or "Pattern." These terms may be followed by the term "Number" or an abbreviation of that word. The abbreviation for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., No or No.). The abbreviation for the word "Model" shall be "Mod" or "Mod."
[Nonretroactive January 1, 2003]
(Added 2000) (Amended 2001)

[Note: Prefix lettering may be initial capitals, all capitals or all lower case.]

*(d) except for equipment with no moving or electronic component parts and not-built-for-purpose, **~~software~~** **microprocessor**-based devices, a nonrepetitive serial number;*
[Nonretroactive as of January 1, 1968]

(e) for **~~not-built-for-purpose, software~~** **microprocessor**-based devices the current software version designation **or revision number**;
(Added 2003)

(f) the serial number shall be prefaced by words, an abbreviation, or a symbol, that clearly identifies the number as the required serial number; and
[Nonretroactive as of January 1, 1986]

(g) the serial number shall be prefaced by the words "Serial Number" or an abbreviation of that term. Abbreviations for the word "Serial" shall, as a minimum, begin with the letter "S," and abbreviations for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., S/N, SN, Ser. No, and S No.).
[Nonretroactive as of January 1, 2001]

(h) for devices that have an NTEP Certificate of Conformance (CC), the CC Number or a corresponding CC addendum number ~~shall be~~ prefaced by the terms "NTEP CC," "CC," or "Approval." These terms may be followed by the term "Number" or an abbreviation of that word. The abbreviation for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., No or No.).
[Nonretroactive as of January 1, 2003]

The required information shall be so located that it is readily observable without the necessity of the disassembly of a part requiring the use of any means separate from the device.
(Amended 1985, 1991, 1999, 2000, 2001, 2003, and 200X)

~~***G-S.1.1. Location of Marking Information for Not Built-For-Purpose, Software-Based Devices. - For not built-for-purpose, software-based devices, the following shall apply:***~~

~~***(a) the manufacturer or distributor and the model designation shall be continuously displayed or marked on the device (see note below), or***~~

~~***(b) the Certificate of Conformance (CC) Number shall be continuously displayed or marked on the device (see note below), or***~~

~~***(c) all required information in G-S.1. Identification. (a), (b), (c), (e), and (h) shall be continuously displayed. Alternatively, a clearly identified "view only" System Identification, G-S.1. Identification, or Weights and Measures Identification shall be accessible through the "Help" menu. Required information includes that information necessary to identify that the software in the device is the same type that was evaluated.***~~

~~***Note: Clear instructions for accessing the remaining required G-S.1. information shall be listed on the CC. Required information includes that information necessary to identify that the software in the device is the same type that was evaluated.***~~
~~***[Nonretroactive as of January 1, 2004]***~~
~~**(Added 2003)**~~

G-S.1.~~2~~1. Remanufactured Devices and Remanufactured Main Elements. - *All remanufactured devices and remanufactured main elements shall be clearly and permanently marked for the purposes of identification with the following information:*

(a) The name, initials, or trademark of the last remanufacturer or distributor;

(b) The remanufacturer's or distributor's model designation if different than the original model designation.

[Nonretroactive as of January 1, 2002]
(Added 2001)

Note: Definitions for "manufactured device," "repaired device," and "repaired element" are also included (along with definitions for "remanufactured device" and "remanufactured element") in Appendix D, Definitions.

Table G-S.1. Identification		
	Built-for-Purpose Instruments, Elements, or Systems	**Not Built-for-Purpose Instruments, Elements, or Systems**
Name, initials, or trademark of the manufacturer or distributor	**M**	**D[2]**
Model designation	**M[1]**	**D[2]**
Specific model designation	**M[1] or D**	
Serial number	**M**	**Not required**
Revision number or Software Version number	**M or D**	**D**
Certificate of Conformance (CC) number	**M or D**	**D[2]**

M: **Physically and permanently marked**

D: ***Either: (1) displayed by accessing a clearly identified view only System Identification, G-S.1. Identification, or Weights and Measures Identification accessible through the "Help" menu. Required information includes that information necessary to identify that the software in the device is the same type that was evaluated, or (2) continuously displayed. Note: For revision or software version number, clear instructions for accessing this information shall be listed on the CC in lieu of the "Help" menu. Required information includes that information necessary to identify that the software in the device is the same or subsequent type that was evaluated.***
(Nonretroactive as of January 200X)

Note 1: ***As a minimum, the model designation (positively identifying the pattern, design, type, series, generic, or trademark designation) must be marked on the device. If the model designation changes with differing parameters such as size, features, options, intended application, not Handbook 44 compliant, construction, etc., the specific model designation shall be physically marked or continuously displayed or be capable of being displayed.***
(Nonretroactive as of January 200X)

Note 2: ***As a minimum, either the manufacturer or distributor and the model designation, or the CC Number shall be continuously displayed. Clear instructions for accessing the remaining required G-S.1. information shall be listed on the CC, which may be available as an unaltered copy of the CC printed by the device or through another on-site device.***
(Nonretroactive as of January 200X)

(Table Added 200X)

Definition: Not-built-for-purpose device. Any main device or element which was not originally manufactured with the intent that it be used as, or part of, a weighing or measuring device or system.

Background/Discussion: During the 2003 NCWM Annual Meeting, the Committee agreed to split Item 310-1, a proposal to modify paragraph G-S.1. Identification to address software based devices, into two parts: Item 310-1A and 310-1B. Voting Item 310-1A, a proposal to define "built-for-purpose" software-based devices and to require the marking of specific identification information on "not-built-for-purpose" software based devices, was proposed for a vote and adopted.

The Committee believed that Item 310-1B, a proposal to include "built-for-purpose" devices and to define "not-built for-purpose" devices was not sufficiently prepared and should remain an information item to allow for additional development. This proposal appears in the recommendation above. Industry representatives indicated there was a need to address both "not-built-for-purpose" software based devices and "built-for-purpose" software based devices equally and provided the Committee with proposed language as shown in the recommendation. Based on the comments, regarding inequity, received the Committee kept the proposal to modify G-S.1. to include "built-for-purpose" software based devices an information item to allow for further review and development by the NTETC Technical Sectors and the regional weights and measures associations.

At its September 2003 Meeting, the Western Weights and Measures Association (WWMA) had no opposition to allowing alternate methods for providing required identification information marking on "built-for-purpose" software-based devices. The WWMA supported the concept of allowing "built-for-purpose" software-based devices to display G-S.1. Identification information provided that the physical identification information contains the following minimum information: (1) manufacturer or distributor, (2) model designation, and (3) serial number. The WWMA recommended this item remain informational until it can be further developed.

Prior to the October 2003 NTETC Measuring Sector Meeting, the NIST NTETC Technical Advisors developed an alternate proposal to modify G.S.1. and add a new Table G.S.1. that provides alternate methods other than physical markings for meeting some of the requirements of G-S.1. for both "not-built-for-purpose" and "built-for-purpose" devices. The alternate proposal was presented to the NTETC Measuring Sector for consideration.

At its October 2003 Meeting, the NTETC Measuring Sector reviewed an alternate proposal developed by the NIST Weights and Measures Division (WMD) which presents the G-S.1. information in tabular format. The Sector agreed with the WMD proposal in principle, but recommended some small changes to simplify the table. The Sector forwarded the alternate WMD proposal for G-S.1. as modified to the Southern Weights and Measures Association (SWMA) as well as the NCWM S&T Committee.

At its October 2003 Meeting, the SWMA reviewed the proposal from the NTETC Measuring Sector and agreed that the proposal should be forwarded to the NCWM S&T Committee for consideration as a voting item.

At the 2004 NCWM Interim Meeting, the S&T Committee heard both support and opposition to the proposal developed by the NTETC Measuring Sector at its October 2003 Meeting. There was general support for the table developed by WMD and modified by the NTETC Measuring Sector. There was also general support for the definition of "not-built-for-purpose" device. The SMA opposed the NTETC Measuring Sector's proposal because of the difference in requirements for "built-for-purpose" devices and "not-built-for-purpose" devices. The primary SMA opposition was that, in the proposal, "built-for-purpose" devices are required to have the name of the manufacturer, the model designation, and a nonrepetitive serial number physically marked on the device. "Not-built-for-purpose" devices are allowed to either physically mark or display those three pieces of basic information. The SMA believes that the built-for-purpose devices should have the same option of marking or displaying the make, model, and serial number. One weights and measures official stated that the revision number or software version number should be marked or displayed on "built-for-purpose" devices as is required on "not-built-for-purpose" devices. The official believes that changes can be made to the programming of some "built-for-purpose" devices that is not readily apparent to field officials. Marking or displaying a new version number will assist the field official in determining whether or not the metrological functions of the device are the same as the model submitted for NTEP evaluation. The Committee agreed that the revision number or software version numbers should be readily available to field officials and modified Table G-S.1. to include the requirement that a "built-for-purpose" device have the current revision number or software version number displayed or permanently marked. The Committee also recognized that currently Handbook 44, OIML R-76 Nonautomatic weighing instruments, and OIML R-117 Measuring systems for liquids other than water all require the name of the manufacturer, a model designation, and serial number information to be marked on a "built-for-purpose" devices. The Committee believes that, at this time, continuing the requirement for marking basic identification information does not place an additional burden on "built-for-purpose" device manufacturer's. The 2003 Weighing Sector Meeting, was held prior to the 2003 NTETC Measuring Sector Meeting; therefore, the Weighing Sector did not review and discuss the current proposal. The Weighing Sector was not scheduled to meet again until the fall of 2004. The Weighing Sector's Technical advisor advised the Committee of the plan to distribute the current proposal along with a ballot requesting support from the membership prior to the 2004 NCWM Annual Meeting. The Committee agreed that if the Weighing Sector supported the proposal the item should be ready for a vote of the Conference at that NCWM Annual Meeting.

At its April 2004 Meeting the SMA determined that based on the results of the S&T Committee's request to poll the Weighing Sector Members, there appears to be no clear consensus that the proposal is ready to be a voting item. The SMA opposed this item and recommended that it be removed from the voting calendar.

At its May 2004 meeting, NEWMA received comments from the SMA opposing 310-1 because there was no clear consensus among the Weighing Sector members. Gilbarco requested the item be made informational. Gilbarco

believed that G-S.1.(e) requiring a software revision number would be overly burdensome to both industry and NTEP since there are frequent software changes and that the non-retroactive date of January 2004 in proposed new Table G-S.1. has already passed. Belue Associates also recommended making this item informational. NEWMA agreed to recommend that item 310-1 be changed to an Information Item.

At the 2004 NCWM Annual Meeting, during the open hearing the SMA stated that item 310-1 should not go forward for a vote because the ballot of the Weighing Sector failed to provide clear support for the item. A manufacturer stated that the term microprocessor is not appropriate because their devices contain numerous microprocessors. Another manufacturer stated that the requirement for marking the current software version number would place an unrealistic burden on their company. The Committee agreed that sufficient opposition and questions were raised during the open hearing to demonstrate that the item is not sufficiently developed to be a voting item at this meeting. The Committee agreed to make item 310-1 an information item to be returned to the NTETC Weighing and Measuring Sectors for further development.

For more background information, refer to the 2003 S&T Final Report.

310-2 W G-N.3. Compatibility of Indicators and Weighing or Measuring Elements

(This item was withdrawn.)

Source: National Type Evaluation Technical Committee Measuring Sector

Recommendation: Add a new paragraph G-N.3. Compatibility of Indicators and Weighing or Measuring Elements to Handbook 44 to clarify what requirements must be met to interface an indicating element and a weighing or measuring element that have not been previously evaluated together on a single NTEP Certificate of Conformance (CC), but which have their own NTEP CC listing compatible communication specifications.

G-N.3. Compatibility of Indicators and Weighing or Measuring Elements. - To be considered compatible, all of the following conditions shall be met:

(a) The communication means to be used for the input to the electronic indicator (analog, digital, pulse, frequency, serial, etc.) has been previously evaluated with a weighing and measuring element;

(b) The communication means to be used for the output of the weighing or measuring element (analog, digital, pulse, frequency, serial, etc.) has been previously evaluated with an electronic indicator;

(c) The communication means to be used for the electronic indicator input is the same as the communication means to be used for the weighing and measuring element output (analog-analog, digital-digital, pulse-pulse, frequency-frequency, serial-serial, etc.);

(d) The devices are communicating with each other and the system into which they are installed can be accurately calibrated; and

(e) If required, Handbook 44 compliant tickets can be printed.

Background/Discussion: At the May 2001 NTEP Laboratory Meeting, one of the participating laboratories asked for input regarding what testing should be required if the manufacturer of an indicator wanted a CC to recognize an indicator for use with different types of measuring devices, such as positive displacement (pd) meters, turbine meters, and mass flow meters. The California NTEP Laboratory agreed to provide a draft of changes to the Liquid-Measuring Devices Checklist and Procedures that included requirements for indicators intended for use with more than one device type.

At its October 2003 Meeting, the NTETC Measuring Sector reviewed a proposal submitted by the work group to add a new paragraph N.X. only to Handbook 44 Section 3.30., 3.31., 3.32., and 3.37. The NTETC Measuring Sector modified the proposal as shown above to be a General Code Test Note to provide guidance to field officials for

determining the compatibility of indicators and weighing and measuring elements. The Sector agreed to forward the modified proposal to the NCWM S&T Committee through the SWMA.

At its October 2003 Meeting, the SWMA recommended that the proposal be forward to the NCWM S&T Committee as an information item.

At its November 2003 Meeting, the Scale Manufacturers Association agreed that the proposed new paragraph G-N.3. was not sufficiently developed for weighing applications and recommended that the proposal be referred to the NTETC Weighing Sector for further development.

At the 2004 NCWM Interim Meeting, the S&T Committee heard several comments indicating that this item is not sufficiently developed to move forward. However, one manufacturer stated that his company manufactures measuring and indicating elements or components that can be interfaced to provide a complete measuring system. He believed this item needed to be in Handbook 44 for the use of the field official and that the proposal as written provided at least some guidance on compatibility of components. The NIST WMD stated that there may be better alternatives, such as the Examination Procedure Outlines, to placing these guidelines in Handbook 44. The Committee agreed that the item is not sufficiently developed to move forward. The Committee decided to withdraw Item 310-2 from the S&T Committee Agenda until it is further developed and resubmitted with the support of the NTETC Weighing and Measuring Sectors.

For more background information, refer to the 2003 S&T Final Report.

320 SCALES

320-1 V S.1.12. Manual Gross Weight Entries and UR.3.9. Use of Manual Gross Weight Entries

(This item was adopted.)

Source: Carryover Item 320-1. (This item originated from the Western Weights and Measures Association (WWMA) and first appeared on the Committee's 2002 agenda.)

Recommendation: Modify paragraphs S.1.12. and UR.3.9. as follows:

S.1.12. Manual ~~Gross~~ Weight Entries. - *A device* ***when being used for direct sale*** *shall accept an entry of a manual gross* ***or net*** *weight value only when the scale* ***~~is at gross load zero and the scale~~ gross or net* weight*** *indication is* ***at*** *zero* ***~~in the gross weights display mode~~.*** *Recorded manual weight entries, except those on labels generated for packages of standard weights, shall identify the weight value as a manual weight entry by one of the following terms: "Manual Weight," "Manual Wt," or "MAN WT." The use of a symbol to identify multiple manual weight entries on a single document is permitted, provided that the symbol is defined on the same page on which the manual weight entries appear and the definition of the symbol is automatically printed by the recording element as part of the document.*
[Nonretroactive as of January 1, 1993]
[*Nonretroactive as of January 1, 2005]
(Added 1992) **(Amended 2004)**

UR.3.9. Use of Manual Gross or Net Weight Entries. - Manual gross or net weight entries are permitted ~~**for use**~~ in the following applications only:

(1) When **a point-of-sale system interfaced with a scale gives** credit ~~**is given**~~ for a weighed item ~~**on point-of-sale systems interfaced with scales;**~~
(2) When an item is pre-weighed on a legal for trade scale and marked with the correct net weight;
(3) When a device or system **is** generat~~**es**~~**ing** labels for standard weight packages;
(~~3~~4) When postal scales or weight classifiers **are** generat~~**e**~~**ing** manifests for packages to be picked up at a later time; or
(4~~5~~) When livestock and vehicle scale systems **are** generat~~**e**~~**ing** weight tickets to correct erroneous tickets.
(Added 1992) (Amended 2000 **and 2004)**

Discussion: Since 2002, the Committee considered multiple proposals to recognize applications where manual weight entries are conducted on point-of-sale systems (POS). Specific instances include transactions where items exceed the POS nominal capacity or the Universal Product Code is illegible, but the weight and unit price information are available on the item's label and can be entered in the POS to calculate a price.

Handbook 44 includes provisions to deter fraudulent use of the manual weight entry feature. Paragraph S.1.12. describes when a scale can accept such an entry and how it must be identified. Paragraph UR.3.9. specifies only four applications where the use of manual weight entries are permitted. Handbook 44 also requires that a scale shall be suitable for use, which includes its weighing capacity. The feature is not intended as a substitute for a system with insufficient weighing capacity.

The Committee acknowledged that manual weight entries are used in gross and net weight transactions. The Committee considered several proposals to address this practice. These proposals were either limited in the applications they covered, unclear on what tare information must be recorded, or appeared to prohibit manual tare entries. After lengthy discussion at the 2003 NCWM Annual Meeting, the Committee agreed to keep the following proposal an information item to allow sufficient time for these deficiencies to be addressed:

> *S.1.12. Manual ~~Gross~~ Weight Entries. - A device shall accept an entry of a manual ~~gross~~ weight value only when the scale is at gross load zero and the scale gross or net* weight indication is at zero ~~in the gross weights display mode~~. Recorded manual weight entries, except those on labels generated for packages of standard weights, shall identify the weight value as a manual weight entry by one of the following terms: "Manual Weight," "Manual Wt," or "MAN WT." The use of a symbol to identify multiple manual weight entries on a single document is permitted, provided that the symbol is defined on the same page on which the manual weight entries appear and the definition of the symbol is automatically printed by the recording element as part of the document.*
> *[Nonretroactive as of January 1, 1993]*
> *[*Nonretroactive as of January 1, 2004.]*
>
> UR.3.9. Use of Manual ~~Gross~~ Weight Entries. - Manual ~~gross~~ weight entries are permitted for use in the following applications only: (1) on a point-of-sale system interfaced with scales when credit is given for a weighed item ~~on point-of-sale systems interfaced with scales~~, or when an item is pre-weighed and marked with the correct net weight; (2) when a device or system is generate~~e~~ing labels for standard weight packages; (3) when postal scales or weight classifiers are generate~~e~~ing manifests for packages to be picked up at a later time; ~~or~~ and (4) ~~when~~ on livestock scale and vehicle scale systems generate weight tickets to correct erroneous tickets.

During its September 2003 Annual Technical Conference, the WWMA examined the recommendation developed by the 2003 S&T Committee and an alternate proposal that limited use of the manual weight entry feature to point-of-sale (POS) systems. The WWMA agreed that limiting the use of the feature to POS systems was too restrictive. The WWMA also agreed that the S&T Committee's recommendation would make the current practice of entering preset tare values with a load on the scale during direct sale transactions very difficult. Consequently, the WWMA recommended an alternate proposal for paragraph S.1.12. and modified paragraph U.3.9. to limit manual weight entries to either gross or net weighed items as follows:

> *S.1.12. Manual ~~Gross~~ Weight Entries. - A device shall accept an entry of a manual gross or net weight value only when the scale is at gross load zero and the scale gross or net* weight indication is at zero ~~in the gross weights display mode~~. Recorded manual weight entries, except those on labels generated for packages of standard weights, shall identify the weight value as a manual weight entry by one of the following terms: "Manual Weight," "Manual Wt," or "MAN WT." The use of a symbol to identify multiple manual weight entries on a single document is permitted, provided that the symbol is defined on the same page on which the manual weight entries appear and the definition of the symbol is automatically printed by the recording element as part of the document.*
> *[Nonretroactive as of January 1, 1993]*
> *[*Nonretroactive as of January 1, 2005]*
> (Added 1992) (Amended 2004)

UR.3.9. Use of Manual ~~Gross~~ Weight Entries. - Manual gross or net weight entries are permitted for use in the following applications only: (1) on a point-of-sale system interfaced with scales when credit is given for a weighed item ~~on point-of-sale systems interfaced with scales~~, or when an item is pre-weighed and marked with the correct net weight; (2) when a device or system is generate~~e~~ing labels for standard weight packages; (3) when postal scales or weight classifiers are generate~~e~~ing manifests for packages to be picked up at a later time; and (4) on livestock scale and vehicle scale systems that generate weight tickets to correct erroneous tickets.

One scale manufacturer noted that prepackaged standard weight commodities require nutritional labeling; therefore, paragraph S.1.12. should specify use of the feature only in direct sales applications. The Committee considered a recommendation to modify paragraph S.1.12. to permit a device to accept a manual weight entry when the scale is at gross or net load zero. The Committee concluded that this practice would mislead the customer in direct sales applications to believe that the indicated or printed weight information on the receipt represents the object on the scale.

The Northeastern Weights and Measures Association recommended modifying the proposal to require manual weight entries only when a device is used for direct sale, removing the term "gross" from paragraph UR.3.9. and making the proposal an information item.

The Scale Manufacturers Association (SMA) recommended an alternate proposal to modify paragraphs S.1.12. and UR.3.9. shown in the recommendation above. The Committee agreed with SMA's recommendation to modify paragraph S.1.12. as shown in the recommendation above to include the text "when being used for direct sale." The text was added to paragraph S.1.12. to eliminate any conflict that might arise when using the manual weight entry feature to label standard weight packages on scales approved for direct sale applications. The Committee modified the proposal to permit use of scales to prepack items without requiring the scale to return to zero between each weighment. Other modifications were made to the proposal to ensure that the text was grammatically correct.

The Committee acknowledged the importance of using a "legal for trade" scale to obtain weight values for preweighed items and modified the SMA proposal accordingly.

For more background information, refer to the 2002 and 2003 S&T Final Reports.

320-2 W S.6.4. Railway Track Scales

(This item was withdrawn.)

Source: Carryover Item 320-3. (This item originated from the Central Weights and Measures Association (CWMA) and first appeared on the Committee's 2003 agenda.)

Discussion: The Committee considered a proposal to modify paragraph S.6.4. in the Scales Code as follows:

S.6.4. Railway Track Scales. - A railway track scale shall be marked with the maximum capacity of each section of the load-receiving element of the scale. Such marking shall be accurately and conspicuously presented on, or adjacent to, the identification or nomenclature plate that is attached to the indicating element of the scale. ~~*The nominal capacity of a scale with more than two sections shall not exceed twice its rated section capacity. The nominal capacity of a two section scale shall not exceed its rated section capacity*~~*. *The marked nominal capacity shall not exceed the sectional capacity (SC) multiplied by the number of sections (N) of the scale minus 0.5 sections. The formula is stated as Nominal Capacity # SC x (N - 0.5)*.*
*[*Nonretroactive as of January 1, 200~~2~~4]*

This proposal was intended to increase the allowable nominal capacity of railway track scales by modifying the formula in paragraph S.6.4. Most manufacturers acknowledge that modular systems designed to railroad engineering specifications are able to withstand loads greater than those permitted in paragraph S.6.4. However, one manufacturer found that the length of modular systems is limited by the ratio of the nominal capacity to the section capacity allowed in paragraph S.6.4.

Any requirement that addresses scale capacity must not conflict with the requirement that prohibits scales from operating outside of the allowable limits of their marked capacity. Movement of locomotives across railway track scale systems results in loads that exceed the marked scale capacity. Properly designed systems can withstand the overload and indicate an accurate weight once the total load is no longer in excess of 105 % of the marked scale capacity.

The Committee reviewed examples of railway track scale loading where the movement of rail cars across modular systems resulted in loads that exceeded the nominal capacity limit specified in paragraph S.6.4. During each weighment, cars are uncoupled to prevent coupler interaction or weight transfer. The design load capacity (per railroad requirements) was not exceeded.

In July 2003, the Committee acknowledged that the proposed change to the formula permits nominal capacities that may exceed the system's safe load. Additionally, weights and measures jurisdictions may not have sufficient weights to test systems that exceed 640 000 lb capacity. Consequently, the Committee recommended further review of the proposal by manufacturers and the NTETC Weighing Sector.

The CWMA recommended the proposal move forward as written pending additional input from the Weighing Sector and the Association of American Railroads (AAR). The CWMA also noted that if any abbreviations for section capacity were adopted as outlined in S&T Item 320-3 then those abbreviations should be used in the formula.

The Western Weights and Measures Association heard testimony from the AAR indicating they did not support the proposal because the proposed formula allows systems with capacities that would exceed a scale's structural capacity. The AAR was satisfied with the current language in paragraph S.6.4., but was willing to work with the submitter of the proposal to address the submitter's concerns. Based upon the testimony from the AAR, the WWMA recommended the proposal be withdrawn.

The Southern Weights and Measures Association recommended the NCWM S&T Committee withdraw this proposal, but did not provide its rationale for reaching this position.

The AAR also noted that the proposal sets no limits on nominal capacity, thus permitting systems with capacities far above the typical weight loads. The AAR indicated that it has not received any requests for changes to capacities or input on problems with existing capacity limits from railway track scale users or manufacturers. The AAR found that the heaviest gross load for existing four axle cars is 315 000 lb, yet a two-section railway track scale equipped with 100 000 lb load cells can accommodate a load of 340 000 lb.

One representative from the railroad industry noted that there are limits to the amount of test weight that can be concentrated on a 70-foot railway track scale. For example, only 100 000 lb can be concentrated in a 7-foot span. Furthermore meeting both the current Handbook 44 minimum requirement for a test to 12.5 % scale capacity with test weights and then 25 % of scale capacity is difficult, if the proposal allows scales that exceed 500 000 lb capacity.

The Committee later considered an alternate proposal developed by Systems Associates, Inc., the submitter of the original proposal as follows:

Modify paragraph S.6.4. as follows:

S.6.4. Railway Track Scales.

(a) A railway track scale shall be marked with the maximum capacity of each section of the load-receiving element of the scale. Such marking shall be accurately and conspicuously presented on, or adjacent to the identification or nomenclature plate that is attached to the indicating element of the scale.

(b) *The nominal capacity of a railway track scale ~~with more than two sections~~ shall not exceed ~~twice its rated section capacity~~* the lesser of; 640 000 lb or 80 000 lb for each 5 feet of weigh rail length or portion thereof and; the section capacity (SC) multiplied by the number of sections (N) of the scale minus 0.5. The

formula is stated as Nominal Capacity = SC x (N - 0.5). ~~*The nominal capacity of a two section scale shall not exceed its rated section capacity.*~~
*[*Nonretroactive as of January 1, 2002]*

Add new paragraph UR.X. as follows:

UR.X. Railcars weighed statically shall be uncoupled and alone on the load-receiving element as the weight is recorded.

The Committee has not heard sufficient technical grounds for modifying the formula to permit unlimited nominal capacities for railway track scales. The proposal appears to have little support from parties that would be most affected by the changes to paragraph S.6.4., if the proposal were adopted. Additionally, there remains some concern about the difficulty of locating sufficient test weights and the ability to concentrate a test load on scales with capacities that exceed 640 000 lb. Consequently, the Committee withdrew the proposal from the agenda and asked the AAR and Systems Associates, Inc. to find an alternate proposal that is amenable to both parties and the industries they represent.

Editorial Note: The Northeastern Weights and Measures Association (NEWMA) proposal to modify Table 4, Minimum Test Weights and Test Loads begins to address the maximum test load on all large capacity scales. erroneously appeared in Interim Agenda Item 320-2. The Committee agreed that it has merit, but is insufficiently developed for Committee action. Consequently, NEWMA's proposal now appears in Appendix A as developing item Part 2, Scales Code in the 2004 Committee's Final Report.

320-3 VC Table S.6.3.a. Marking Requirements and Table S.6.3.b. Notes for Table S.6.3.a; Note 24 Section Capacity Prefix

(This item was adopted.)

Source: Central Weights and Measures Association (CWMA)

Recommendation: Modify Table S.6.3.a. Marking Requirements as follows:

Table S.6.3.a.
Marking Requirements

To Be Marked With ⇓	Weighing Equipment				
	Weighing, load-receiving, and indicating element in same housing or covered on the same CC[1]	**Indicating element not permanently attached to weighing and load-receiving element or covered by a separate CC**	**Weighing and load-receiving element not permanently attached to indicating element or covered by a separate CC**	**Load cell with CC (11)**	**Other equipment or device (10)**
Manufacturer's ID (1)	**X**	**X**	**X**	**X**	**X**
.	.	.	.	.	.
.	.	.	.	.	.
.	.	.	.		.
Section Capacity **and Prefix** (14)(20)(22)**(24)**		**X**	**X**		

Note: For applicable notes, see Table S.6.3.b.

[1]Weighing/load-receiving elements and indicators which are in the same housing or which are permanently attached will generally appear on the same CC. If not in the same housing, elements shall be hard wired together or sealed with a physical seal or an electronic link. This requirement does not apply to peripheral equipment that has no input or effect on device calibrations or configurations.

(Added 1990) (Amended 1992, 1999, 2000, 2001 ~~and~~ 2002**, and 2004)** (Footnote 1 Added 2001)

Add new Note 24. to Table S.6.3.b. Notes for Table S.6.3.a. as follows:

24. The section capacity shall be prefaced by the words "Section Capacity" or an abbreviation of that term. Abbreviations shall be "Sec Cap" or "Sec C" All capital letters and periods may be used. (Added 2004)

Discussion: The CWMA believes that current NIST Handbook 44 may be interpreted to prohibit the abbreviation of section capacity. Manufacturers abbreviate marking information because some device identification badges are limited in space. The CWMA recommended adding a new paragraph S.6.4.3. that requires identification of section capacity information with a prefix and defines acceptable abbreviations for that prefix. The CWMA did not submit specific language for addressing the abbreviation of section capacity in Table S.6.3.a. Marking Requirements and Table S.6.3.b. Notes For Table S.6.3.a.

The Western Weights and Measures Association (WWMA) heard that the NTETC Weighing Sector and manufacturers supported the intent of the proposal. However, the WWMA believed the CWMA proposal should be simplified and modified for clarity. The WWMA agreed that use of the abbreviations "SC" and "S Cap" to identify section capacity are not acceptable because they might be interpreted to represent scale capacity. The WWMA considered a recommendation to include identification requirements for section capacity in General Code paragraph G-S.1. Identification since that requirement specifies other marking information and prefixes. Ultimately, the WWMA decided to address the abbreviation of "section capacity" as a Scales Code requirement. The WWMA worked with the NTETC Weighing Sector Technical Advisor to develop the alternate proposal to modify Table S.6.3.a. and Table S.6.3.b., which is shown in the recommendation above.

The Scale Manufacturers Association supported the proposal for including in Table S.6.3.a. and Table S.6.3.b. language that requires a prefix to identify the scale's section capacity and specifies how the prefix must be abbreviated.

The Committee agreed that the best approach for designating a prefix that identifies the scale's section capacity is the WWMA alternate proposal which is outlined in the recommendation above. This proposal is consistent with the current practice of listing other scale marking requirements in one table. The Committee modified the proposed new Note 24. by removing the word "Acceptable." The Committee did not believe it was necessary to include this term since acceptable abbreviations are adequately defined in the note's text.

320-4 VC N.3.2. Field Standard Weight Carts

(This item was adopted.)

Source: Carryover Item 320-11. (This item originated from the Northeastern Weights and Measures Association (NEWMA) and first appeared on the Committee's 2003 agenda.)

Recommendation: Add new paragraph N.3.2.

> **N.3.2. Field Standard Weight Carts. - Field Standard Weight Carts that comply with the tolerances expressed in Fundamental Considerations, paragraph 3.2. (i.e., one-third of the smallest tolerance applied) may be included as part of the minimum required test load for shift tests and other test procedures.**
> **(Added 2004)**

Discussion: Originally, NEWMA submitted a proposal which was intended to modify the NIST Handbook 44 Scales Code to recognize the use of weight carts during a shift test. During its October 2003 Interim Meeting, NEWMA indicated that its original proposal was not ready for adoption by the NCWM. New York noted that NEWMA's proposal shown below should include a reference to the Handbook 44 Fundamental Considerations 3.2 Tolerances for Standards. New York also recommended modifying NEWMA's proposal to eliminate any requirements that specify a particular type of information that must be included in the weight cart's calibration report as follows:

> N.1.3.4.1. Weight Carts. - Weight carts may be included as part of the minimum required test load required in N.1.3.4. provided that the mass value of the weight cart has been determined by weights and measures and is clearly marked thereon. Further, a certificate of calibration issued by the weights and measures jurisdiction that issued the weight certificate must be available at all times. ~~Said certificate shall contain at a minimum the following information: the date of calibration, name, model, and serial number of the weight cart; the minimum graduation of the scale used in the calibration of the weight cart; and the name of the jurisdiction and inspector or metrologist who determined the mass value~~.

At the 2004 NCWM Interim Meeting, the Committee heard that the NEWMA proposal was unclear as to how the mass value is determined by a weights and measures jurisdiction. The Committee agreed that the portions of the proposed language intended to address the reference standard should include information about the uncertainty of the scale used as the reference standard rather than the scale's minimum graduation size. The uncertainty of the reference scale is essential in the calibration report for the weight cart to establish the accuracy of measurements made with the field standard.

The Central Weights and Measures Association (CWMA) developed an alternate proposal that specified weight carts may be used as part of the minimum load for shift tests on vehicle scales. The CWMA believed that an additional proposal was needed to permit the use of weight carts in tests other than shift tests. The CWMA also recommended that the proposal make reference to weight carts meeting the Fundamental Considerations Tolerance for Standards when a weight cart is used as the testing apparatus in accordance with the requirements for calibration of a field test standard in NIST Handbook 105-8, Specification and Tolerances for Field Standard Weight Carts.

The Committee agreed that the test note should include language that permits use of weight carts for shift tests and other tests as well as specify a standard for the weight cart. The Fundamental Considerations prescribe the allowable error in a field test standard used by weights and measures officials. The Committee also noted that the proposed paragraph designation of "N.1.3.4.1." is already in use. Consequently, the Committee modified the

CWMA proposal as shown in the recommendation above to include a new paragraph designation and to require that field standard weight carts comply with the guidelines for test apparatus in the Fundamental Considerations.

The Committee acknowledged that it is general knowledge that NIST Handbook 105-8 is available through the NIST Weights and Measures Division web site at www.nist.gov/owm and Handbook 105-8 was published in December 2003.

320-5 VC N.1.5. Discrimination Test

(This item was adopted.)

Source: Central Weights and Measures Association (CWMA)

Recommendation: Modify paragraph N.1.5. as follows:

> ***N.1.5. Discrimination Test. -*** *A discrimination test shall be conducted on all automatic indicating scales with the weighing device in equilibrium at* ***or near*** *zero load and at* ***or near*** *maximum test load, and under controlled conditions in which environmental factors are reduced to the extent that they will not affect the results obtained.* ***For scales equipped with the Automatic Zero-Setting Mechanism (AZSM), the discrimination test may be conducted at a range outside of the AZSM range.***
> *[Nonretroactive as of January 1, 1986]*
> (Added 1985) **(Amended 2004)**

Discussion: The CWMA agreed that it is impossible to conduct a discrimination test and verify the zone of uncertainty *at* zero if the Automatic Zero-Setting Mechanism (AZSM) is operational. The CWMA believed the test should be conducted *near* zero without the weights and measures official having to disable AZSM. The CWMA did not want officials having to access the inside of scales to disable and then make operational AZSM or any other feature.

The Scale Manufacturers Association supported this item.

The Committee recognized that there are environmental and scale design factors that can affect the results of a discrimination test. The Committee also acknowledged that it is acceptable to perform a discrimination test at zero load just above the zero tracking range for scales that are equipped with AZSM. The test is also acceptable when performed just below the scale's maximum capacity, in the event that a scale is set up to display an indication of over capacity when that maximum total load is in excess of the capacity established in paragraph S.1.7. Capacity Indication, Weight Ranges, and Unit Weights.

The Committee believes it is important for weights and measures officials to understand how to conduct the discrimination test on scales equipped with or not equipped with AZSM. The Committee agreed that the test shall be conducted either "at or near" the zero load and "at or near" the maximum test load and modified the proposal accordingly. The modified language also allows officials to use their discretion in conducting the discrimination test on scales equipped with AZSM. In this case, the official may elect to disable the feature or conduct the discrimination test near the zero load and near the maximum test load when an operational AZSM makes the test difficult.

320-6 VC Table 3 Parameters for Accuracy Classes; Footnote 5 Grain Hopper Scales

(This item was adopted.)

Source: Central Weights and Measures Association (CWMA)

Recommendation: Add a new footnote to Table 3 as follows:

Table 3
Parameters for Accuracy Classes

Class	***Value of the verification scale division (d or e[1])***	***Number of scale[4] divisions (n)***	
		Minimum	***Maximum***
	SI Units		
.	.	.	.
.	.	.	.
.	.	.	.
III[2, 5]	*0.1 to 2 g, inclusive*	*100*	*10 000*
.	.	.	.
.	.	.	.
.	.	.	.
	INCH-POUND Units		
III[2, 5]	*0.0002 lb to 0.005 lb, inclusive*	*100*	*10 000*
.	.	.	.
.	.	.	.
.	.	.	.

[1]For Class I and II devices equipped with auxiliary reading means (i.e., a rider, a vernier, or a least significant decimal differentiated by size, shape, or color), the value of the verification scale division"e" is the value of the scale division immediately preceding the auxiliary means.

.
.
.

[5]The minimum number of scale divisions for a Class III Hopper Scale used for weighing grain shall be 2000.

[Nonretroactive as of January 1, 1986]
(Amended 1986, 1987, 1997, 1998, 1999, ~~and~~ 2003, **and 2004)** (Footnote 4 Added 1997) **(Footnote 5 Added 2004)**

Discussion: Requirements for the minimum and maximum number of scale divisions are listed in Table 3 Parameters for Accuracy Classes; however, the table presently does not recognize a limitation to the minimum and maximum number of scale divisions included in user requirement, paragraph UR.1.2. Grain Hopper Scales. To ensure both manufacturer and users are aware of this limitation, the CWMA recommended adding a new footnote 5 to Table 3 making the information about grain hopper scales available in paragraphs intended for device manufacturers. The CWMA believes that paragraph UR.1.2. requirements for the minimum number of scale divisions for a Class III Hopper Scale used for grain weighing is overlooked.

The Scale Manufacturers Association (SMA) opposed this proposal because it introduces a new application into Table 3. SMA prefers that Table 3 not include any application requirements.

The Committee believes that adding a new note to Table 3 helps to clarify for the manufacturer and official the allowable minimum number of scale divisions for a Class III Hopper Scale used in grain weighing applications. Adding the text from the user requirement into Table 3 is consistent with current Table 3 requirements for hopper scales and further explains the parameters that apply for this device type.

The Committee acknowledged that there are instances where a long laundry list of exceptions can make a requirement unwieldy; however, the proposal does not fall into that category. The Committee remains convinced that Table 3 is the appropriate location for the proposed footnote and the proposal as written provides needed information to parties that must design and inspect devices for compliance with accuracy class requirements.

320-7 W Appendix D; Definition of Counter Scale, S.2.1.3. Scales Equipped with an Automatic Zero-Setting Mechanism, N.1.3.1. Bench or Counter Scales, and N.1.3.8. All Other Scales Except Crane Scales, Hanging Scales, Hopper Scales, Wheel-Load Weighers, and Portable Axle-Load Weighers

(This item was withdrawn.)

Source: Carryover Item 320-4. (This item originated from the National Type Evaluation Technical Committee (NTETC) Weighing Sector and first appeared on the Committee's 2003 agenda.)

Discussion: The Committee was asked to consider several proposals to clarify the definition, shift test, and other requirements for "counter scale" as follows:

> Counter Scale. ~~One~~ A scale that, by reason of its size, arrangement of parts, and ~~moderate~~ with a nominal capacity no greater than 100 kg (220 lb), is adapted for use on a counter or bench. Sometimes called "bench scale." [2.20]

The Western Weights and Measures Association (WWMA) recommended an alternate proposal to amend paragraph S.2.1.3. as follows:

> *S.2.1.3. Scales Equipped with an Automatic Zero-Setting Mechanism. - Under normal operating conditions the maximum load that can be "rezeroed," when either placed on or removed from the platform all at once, shall be:*
>
> *(a) For bench~~,~~ and counter~~, and livestock~~ scales installed prior to January 1, 200X: 0.6 scale division;*
>
> *(b) For livestock scales: 0.6 scale division*
>
> *(~~b~~c) For vehicle, axle-load, and railway track scales: 3.0 scale divisions; ~~and~~*
>
> *(~~c~~d) For all other scales installed prior to January 1, 200X: 1.0 scale division~~.~~; and*
>
> *(e) For all scales other than livestock, vehicle, axle-load, and railway track scales: 0.5 scale division. [Nonretroactive ~~and enforceable~~ as of January 1, ~~1981~~200X]*

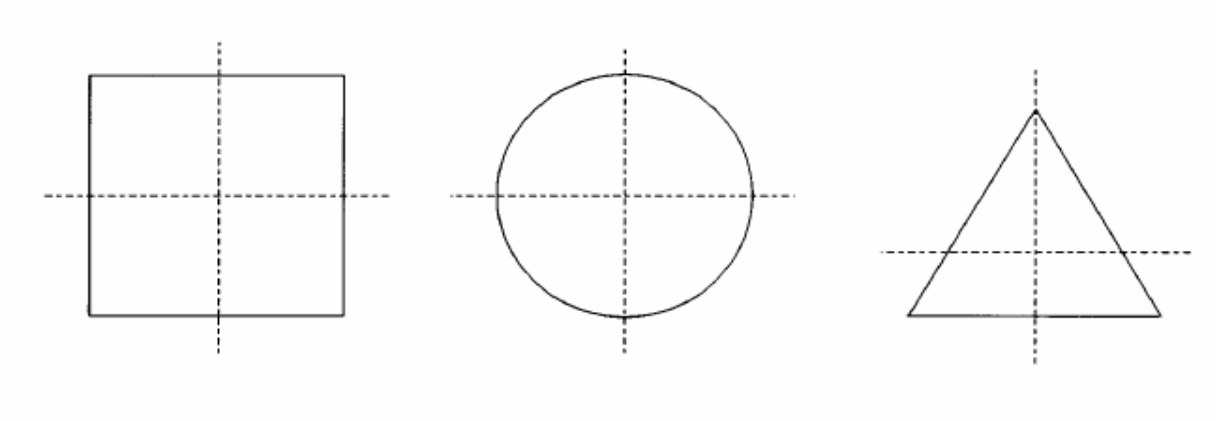
Delete paragraph N.1.3.1. as follows:

> ~~N.1.3.1. Bench or Counter Scales. A shift test shall be conducted with a half capacity test load centered successively at four points equidistant between the center and the front, left, back, and right edges of the load-receiving element.~~

Renumber paragraphs N.1.3.2. Dairy-Product-Test Scale through N.1.3.7. Vehicle On-board Weighing Systems.

Amend paragraph N.1.3.8. as follows:

> N.1.3.7~~8~~. All Other Scales Except Crane Scales, Hanging Scales, Hopper Scales, Wheel-Load Weighers, and Portable Axle-Load Weighers. - When testing a scale with a load receiving element having no more than four load supports, a ~~A~~ shift test shall be conducted with a one-third ~~half~~ capacity test load centered, as nearly as possible, successively at the center of each quarter of the load-receiving element as shown in the figures below.~~,~~ ~~or~~ For scales with a capacity greater than 151 kg (301 lb) and having more than one load support, a shift test may be conducted with a quarter capacity test load centered, as nearly as possible, successively over each main load support.



In 2003, the Committee examined a 2002 NTETC Weighing Sector proposal to modify paragraphs N.1.3.1. and N.1.3.8. that prescribed test procedures based on the number of platform supports. The proposal also revised the definition of "counter scale" to include a nominal capacity limit that distinguishes bench/counter scales from floor scales. A capacity limit of 100 kg for bench/counter scales was recommended for consistency with Measurement Canada requirements.

The Weighing Sector also noted that NIST Handbook 44 paragraph S.2.1.3. Scales Equipped with an Automatic Zero-Setting Mechanism specifies a different maximum load that can be rezeroed for bench/counter scales (0.6 scale division) from that prescribed for all other scales (1.0 scale division).

Industry and weights and measures officials opposed the proposed changes to paragraphs N.1.3.1. and N.1.3.8. because they were too confusing, but they did support modifications to the definition of "counter scale" as shown above.

During its discussions at the 2003 NCWM Annual Meeting, the Committee acknowledged there are benefits to harmonizing requirements. However, the Committee concluded that modifying the definition of counter scale alone did not clarify which shift test procedure is appropriate for a given scale design and did not provide field officials with sufficient information to conduct an appropriate shift test. The Committee recommended that the Weighing Sector consider developing a policy where scale design information must be included on all NTEP Certificates of Conformance to assist officials in the determination of the appropriate shift test for a particular scale design.

The Central Weights and Measures Association (CWMA) believes that the current Handbook 44 definition of "counter scale" was adequate for the official to determine whether or not a scale is classified as a counter scale and to conduct the appropriate shift test. Therefore, the CWMA recommended the proposal to modify the definition of "counter scale" be withdrawn.

The Western Weights and Measure Association (WWMA) heard opposition to the proposed definition as written. The WWMA also reviewed several alternate proposals from NIST. Scale manufacturers commented that language in OIML R 76 Non-Automatic Weighing Instruments is less ambiguous and requires a one-third capacity shift test load centered in the quadrants of a scale. In addition, the test procedure results in a load that has the equivalent effect of a shift test load at one-half capacity that is currently prescribed in paragraph N.1.3.1. Industry indicated that this approach is appropriate since a majority of scales they manufacture meet both U.S. and international performance requirements. Consequently, the WWMA recommended an alternate proposal shown above to address the Weighing Sector's concerns about how to align Handbook 44 with OIML R 76 paragraphs 4.5.7. (Zero-tracking device) and A.4.7. (Eccentricity tests).

The Northeastern Weights and Measures Association (NEWMA) opposed the proposed definition as written, but did not provide an explanation for its opposition. NEWMA also indicated it would need additional time to review the WWMA alternate proposal.

The Southern Weights and Measures Association reviewed the WWMA alternate proposal and recommended that the NCWM S&T Committee keep this proposal an information item until the Weighing Sector has the opportunity to provide input.

The Scale Manufacturers Association (SMA) opposed the proposed definition and recommended that it be withdrawn and returned to the Weighing Sector where it should be considered for harmonization with OIML requirements. The SMA also believed that if modifications are made to paragraph S.2.1.3. then the requirement should specify that the 0.5 division is the maximum load that can be rezeroed for new scales equipped with an AZSM.

NIST WMD noted that the WWMA alternate proposal, as written, appears to include a nonretroactive enforcement date which may eliminate AZSM requirements entirely for existing scales.

The Committee agreed that the proposal needed additional work. The proposals before the Committee have attempted to address three different issues: (1) refining the definition of a device type, (2) reducing the limits for automatic zero setting mechanisms on Class III scales, and (3) prescribing the appropriate shift test procedures for a device type, that seem to have the counter/bench scale as a common thread. The WWMA proposal should be reviewed against current paragraph N.1.3.8. in the 2004 Edition of NIST Handbook 44 to determine what is the most appropriate test load and test pattern. One resounding theme in many comments about the WWMA proposal is that the Weighing Sector should be in agreement that the language harmonizes with OIML requirements. The OIML requirements appear to be based on load support design rather than a specific device nomenclature. Consequently, the Committee is withdrawing this item until the Weighing Sector can develop the issue further and resolve the concerns expressed by industry and weights and measures officials.

320-8 I S.1.1. (c) Zero Indication; Requirements for Markings or Indications for Other than Digital Zero Indications

Source: NCWM S&T Committee

Discussion: In response to a request for an interpretation of paragraph S.1.1.(c), the Committee included on its agenda a proposal to amend the paragraph to clarify the original intent of the requirement as follows:

S.1.1. Zero Indication.

(a) On a scale equipped with indicating or recording elements, provision shall be made to either indicate or record a zero-balance condition.

(b) On an automatic-indicating scale or balance indicator, provision shall be made to indicate or record an out-of-balance condition on both sides of zero.

(c) A zero-balance condition may be indicated by other than a continuous digital zero indication, provided that an effective automatic means is provided to inhibit a weighing operation or to return to a continuous digital indication when the scale is in an out-of-balance condition **and is marked or includes supplemental indications or markings to indicate that the "other than digital zero indication" represents a no-load zero-balance condition of the scale.**

The NTETC Weighing Sector requested clarification from the S&T Committee regarding scales and point-of-sale systems where the device's zero-balance condition is represented by other than digital zero indications such as scrolling messages (advertisements), dashes, or other means. The Weighing Sector requested clarification on whether scales with this feature require additional markings or indications that inform customers that the scales are at a zero-balance condition and are being used properly according to General Code paragraph G-S.6. Marking Operational Controls, Indications, and Features.

The reason for the Weighing Sector's request is that there is disagreement among NIST Weights and Measures Division (WMD), the NTEP laboratories, and manufacturers over the interpretation of NIST Handbook 44 General Code paragraph G-S.6. Marking Operational Controls, Indications, and Features, Scales Code paragraph S.1.1. Zero

Indication, and the interpretation of the discussion included in the 78th (1993) NCWM Specifications and Tolerances Committee Item 320-1 S.1.1. Zero Indication. This has resulted in inconsistent type evaluations and weights and measures code enforcement for scales and point-of-sale systems interfaced with scales that use methods such as screen savers, power savers, scrolling displays, and modes of operation to indicate that a device is at a zero-balance condition when no load is on the scale.

NIST and some of the participating laboratories have stated that General Code paragraph G-S.6 requires weighing devices to be marked or an indication provided that states that zero-balance is represented by other than a digital zero indication and that this interpretation is supported by the Report of the 78th of the NCWM Annual Meeting, S&T Committee Item 320-1. Additionally, NCWM Publication 14 was amended in 2003 to include checklist procedures to verify that digital electronic scales equipped with other than a continuous digital zero indication comply. Other participating laboratories and some manufacturers state that the markings are not necessary because Handbook 44 paragraph S.1.1. (c) does not specifically state that the additional markings are required and that the actions of the 78th NCWM to amend paragraph S.1.1.(c) provided sufficient customer protection for devices that use this feature.

As stated earlier, NIST WMD believes that paragraph G-S.6. requires that a weighing device must be marked or an indication provided that states that zero-balance is represented by other than a digital zero indication (e.g., a zero enunciator is provided or the scale is marked with statements such as “scale at zero” or “scrolling message indicates the scale is at zero”). Handbook 44 code paragraphs have also been adopted for the purpose of providing customers with sufficient information to make an informed decision during a direct sale weighing transaction as follows:

1.10. General Code
- G-S.5.2.2.(d) Digital Indication and Representation
- G-S.5.2.4. Values.
- G-S.5.3.1. On Devices That Indicate or Record in More Than One Unit
- G-S.6. Marking Operational Controls, Indications, and Features
- G-UR.3.3. Position of Equipment

2.20. Scales
- S.1. Design of Indicating and Recording Elements and of Recorded Representations
- S.1.4. Indicators
- S.1.5.4. Readability
- S.1.8.3. Customer’s Indications
- S.1.12. Manual Gross Weight Entries
- S.4.3. Multiple Load-Receiving Elements
- Table S.6.3.b.Notes for Table S.6.3.a.; Note 13 – A scale designed for a special application . . . features.”

NIST WMD also believed that changes were required to Scales Code paragraph S.1.1.(c) to clarify the intent of the past S&T Committee and to prevent further misinterpretation. The S&T Committee concurred with this position and consequently proposed changes to paragraph S.1.1.(c) as outlined above.

During the 2004 NCWM Interim Meeting, the Committee was briefed on some ongoing discussions about zero indications within the Weighing Sector for the past several years. The Weighing Sector was presented with a retail scale using a touch screen with a screen saver that extends the screen’s life. The scale screen saver changes to display the indications when the scale is off zero. In this example, the Weighing Sector agreed there was no fraud, but the scale should display a zero indication prior to a subsequent weighment. Because discussions are still ongoing, some Weighing Sector members believe the proposal may be premature.

Weights and measures officials indicate there may be “not-built-for-purpose” devices which do not comply with the proposed interpretation. The “not-built-for-purpose” devices are interfaced with approved devices; however, they continue weighing when off of zero. Consequently, officials question whether the proposed changes to paragraph S.1.1.(c) are intended to be nonretroactive requirements.

The Committee agreed that its interpretation of paragraph S.1.1.(c) is consistent with the original intent. After hearing comments about how some systems are designed to operate, the Committee recommended that additional

language is needed to clarify that no marking is required if operator intervention is necessary to verify a zero condition before the start of a transaction. The Committee made the proposal an information item to provide sufficient time for input from the Weighing Sector, which did not have the proposal available at its 2003 meeting and for the development of suggested language to address operator intervention.

After the Weighing Sector reviews the proposal at its August 2004 meeting, the Committee plans to move the proposal forward as a voting item on its 2005 agenda. The Committee believes this will provide a record of how the requirement should be applied. The Committee intended that all primary indicators must comply with paragraph S.1.1., therefore, the proposal should be a retroactive requirement.

321 BELT-CONVEYOR SCALE SYSTEMS

321-1 VC S.1.5. Rate of Flow Indicators and Recorders and UR.1. Use Requirements; Operated Capacity

(This item was adopted.)

Source: Western Weights and Measures Association (WWMA)

Recommendation: Amend paragraphs S.1.5. and UR.1. as follows:

S.1.5. Rate of Flow Indicators and Recorders. *- A belt-conveyor scale shall be equipped with a rate of flow indicator and an analog or digital recorder. Permanent means shall be provided to produce an audio or visual signal when the rate of flow is equal to or less than* ~~***35***~~ ***20 %*** *and when the rate of flow is equal to or greater than* ~~***98***~~ ***100*** *% of the rated capacity of the scale. The type of alarm (audio or visual) shall be determined by the individual installation.*
[Nonretroactive as of January 1,1986]
(Amended 1989 **and 2004)**

UR.1. Use Requirements. - A belt-conveyor scale system shall be operated between ~~**35**~~**20** % and ~~**98**~~ **100** % of its rated capacity.
(Amended 2004)

Discussions: During the 2002 Belt-Conveyor Scale Technical Seminar, there was considerable discussion about harmonization of the NIST Handbook 44 Belt-Conveyor Scale Systems Code with OIML R 50 Continuous Totalizing Automatic Weighing Instruments. Preliminary data was presented to provide evidence that belt-conveyor scales tested only at zero and a single flow rate as specified by Handbook 44 may have excessive errors at other flow rates.

Occasionally, there are periods of varying duration, when a scale operates at different flow rates even though most belt-conveyor scales tend to operate a majority of the time at relatively the same flow rate. Other devices in Handbook 44 are tested throughout their rated operating range; therefore, belt-conveyor scales should be subject to similar testing to ensure accuracy at all ranges.

The WWMA heard comments in support of the proposal from a manufacturer and user. The WWMA recommended that the NCWM S&T Committee move the proposal forward as a voting item.

The Southern Weights and Measures Association supported this proposal as written.

The Committee received additional industry support for the proposal as written. The Committee recognized that the proposal was the result of work by the Belt-Conveyor Scale Technical Seminar representatives, the NIST Technical Advisor to the Seminar, and the WWMA.

The original proposal included a proposal to change the nonretroactive date from 1986 to 2004. The Committee discussed the impact of changing the nonretroactive enforcement date from 1986 to 2004. The Committee agreed with NIST that such a change would make the requirement in paragraph S.1.5. less restrictive than the current requirements. The Committee agreed that systems installed prior to 2005 would already meet the less restrictive

requirement for a signal to indicate a rate of flow outside of the 20 % to 100 % range of scale capacity. The Committee acknowledged that it is acceptable for systems to operate within a range that is narrower than the proposed 20 % to 100 % of the scale's capacity as long as it complies with other Handbook 44 requirements. Consequently, the Committee maintained the 1986 nonretroactive enforcement date in paragraph S.1.5. and removed the proposed requirement for different enforcement dates based on an installation before or after January 1, 2005, from the proposal to modify paragraph UR.1. The Committee agreed that the proposal with modifications was ready for a vote as shown in the recommendation above.

321-2 VC N.2. Conditions of Test, N.2.1. Initial Verification, N.2.2. Subsequent Verification, and N.2.3. Minimum Test Load

(This item was adopted.)

Source: Western Weights and Measures Association (WWMA)

Recommendation: Modify paragraph N.2. as follows:

N.2. Conditions of Test. - A belt-conveyor scale shall be tested after it is installed on the conveyor system with which it is to be used and under such environmental conditions as may normally be expected. ~~**It shall be tested at normal use capacity and may also be tested at any other rate of flow that may be used at the installation.**~~ Each test shall be conducted ~~**for**~~ **with test loads no less than the minimum test load.**

~~**(a) not less than 1000 scale divisions**~~
~~**(b) at least three revolutions of the belt, and**~~
~~**(c) at least 10 minutes of operation, or for a normal weighment.**~~

(Amended 1986 **and 2004**)

Add new paragraphs N.2.1., N.2.2., and N.2.3., as follows:

N.2.1. Initial Verification. - A belt-conveyor scale system shall be tested at an intermediate flow rate, near 35 % flow rates and normal use capacity. The system may also be tested at any other rate of flow that may be used at the installation.
(Added 2004)

N.2.2. Subsequent Verification. - Subsequent testing shall include testing at the normal flow rate and other flow rates used at the installation. The official with statutory authority may determine that testing only at the normal flow rate is necessary for subsequent verifications if evidence is provided that the system is used to operate no less than 70 % of the maximum flow rate at least 80 % of the time, or that the range of the normal operational flow rate does not vary by more that 10 %, inclusive of the normal operational flow rate, (e.g. If the normal flow rate is 70 % an acceptable range can be 63 % to 73 %).
(Added 2004)

N.2.3. Minimum Test Load. - The minimum test load shall not be less than the largest of the following values.

(a) 800 scale divisions,
(b) The load obtained at maximum flow rate in one revolution of the belt, or
(c) At least 10 minutes of operation.

The official with statutory authority may determine that a shorter time down to 2 % of the load totalized in one hour at the maximum flow rate may be used, provided that:

2 % of the load totalized in one hour at the maximum flow rate is greater than the time to achieve (a) and (b) and testing is performed that demonstrates that the system can perform within tolerances with both the shorter test time and with minimum totalized loads described in N.2.3. (a), (b), or (c).
(Added 2004)

Discussion: Participants at the 2002 NIST Belt Conveyor Scale Systems Technical Seminar, developed a proposal that requires testing a belt-conveyor scale at several flow rates to verify that it maintains accuracy over a range of flow rates for a specific installation. The seminar participants also developed guidelines for an appropriate minimum test load.

Current NIST Handbook 44 test procedures do not clearly require tests at flow rates other than the normal operating flow rate. Belt-conveyor scales often operate at other flow rates for varying time periods and thus need to provide accurate weighing at all flow rates.

The WWMA heard comments in support of this item from a manufacturer and user. There was also a comment that a corresponding definition for "minimum test load" would be redundant and may not be necessary. The WWMA believes the proposal provides additional clarification of the "minimum test load" thus eliminating the need to amend Appendix D Definitions.

The Southern Weights and Measures Association supported the proposal as written.

The Committee modified the proposal for paragraph N.2.3. to clarify the amount of testing necessary when performing a shorter test so the time period is sufficient in length and does not contribute to scale error. The Committee concluded that defining terms such as "minimum test load," "initial verification," and "subsequent verification" is not necessary since those terms are commonly used in reference to tests on many other types of weighing devices and are thought to be well understood.

321-3 VC N.3.1.2. Initial Stable Zero, N.3.1.3. Test of Zero Stability, and T.1.1. Tolerance Values-Test of Zero Stability

(This item was adopted.)

Source: Western Weights and Measures Association (WWMA)

Recommendation: Amend paragraphs N.3.1.2. and N.3.1.3 as follows:

> **N.3.1.2. Initial Stable Zero. -** The conveyor system shall be operated to warm up the belt and the belt scale shall be zero adjusted as required. A series of zero-load tests shall be carried out until three consecutive zero-load tests each indicate an error which does not exceed ± 0.06 % ~~**of the full-scale capacity**~~ **of the totalized load at full scale capacity for the duration of the test~~, or ± 1 division, whichever is less.~~** No adjustments can be made during the three consecutive zero-load test readings.
> (Added 2002) **(Amended 2004)**
>
> **N.3.1.3. Test of Zero Stability. -** The conveyor system shall be ~~**run**~~ **operated** to warm up the belt and the belt scale shall be zero adjusted as required. A series of zero-load tests shall be carried out immediately before the simulated or materials test until the three consecutive zero-load tests each indicate an error which does not exceed ± 0.06 % ~~**of the full-scale capacity**~~ **of the totalized load at full scale capacity for the duration of the test~~, or ± 1 division, whichever is less.~~** No adjustments can be made during the three consecutive zero-load test readings.
>
> ~~**Immediately after material has been weighed over the belt-conveyor scale during the conduct of the materials test, the zero-load test shall be repeated. The zero-error from this test shall not exceed ± 0.12 % of the full-scale capacity or ± 2 divisions, whichever is less.**~~
> (Added 2002) **(Amended 2004)**

Add a new paragraph T.1.1. Tolerance Values – Test of Zero Stability as follows:

> **T.1.1. Tolerance Values – Test of Zero Stability. – Immediately after material has been weighed over the belt-conveyor scale during the conduct of the materials test, the zero-load test shall be repeated. The**

change in the accumulated or subtracted weight on the Master Weight Totalizer during the zero test shall not exceed 0.12 % of the totalized load at full scale capacity for the duration of the test.
(Added 2004)

Discussion: In 2002, paragraphs N.3.1.2. and N.3.1.3. were added to the Belt-Conveyor Scale Systems Code to define a stable zero and establish an acceptable variation in zero (zero error), when the system is operated at a no load condition. The change was made, in part, to make the code consistent with requirements in OIML R 50 Continuous Totalizing Automatic Weighing Instrument. R 50 defines the allowable zero error in terms of a percent of the totalized load at the system's maximum flow-rate only for the time-period it takes to complete the test. Current paragraphs N.3.1.2. and N.3.1.3. specify the allowable zero error only as a percent of full scale capacity which can be a rather large value and usually results in an error stated in scale divisions since that value is the lesser of the two values. Some comparisons of the allowable zero error in terms of scale divisions, percent of full scale capacity, and percent of capacity for the test duration are shown in the table below:

Comparison of 0.06 % of Scale Capacity to 0.06 % of Test Load (TL)

Full Scale Capacity (ton/ hour)	Belt Speed (ft/ min)	Belt Load (lb/ft)	Belt Length (ft)	Belt Rev Time (rev/ min)	Time Per 3 Rev (min)	3 Rev Load (ton)	10 Min Load (ton)	"d" Size (ton)	Min Test Load (ton)	0.06 % of Capacity (ton)	0.06 % of TL (ton)
250	250	33.33	200	0.8	2.40	10.00	41.67	0.02	41.67	0.15	0.025
500	300	55.56	250	0.83	2.50	20.83	83.33	0.05	83.33	0.3	0.05
650	300	72.22	225	0.75	2.25	24.38	108.33	0.1	108.33	0.39	0.065
1000	650	51.28	1500	2.31	6.92	115.38	166.67	0.1	166.67	0.6	0.1
3000	700	142.86	1800	2.57	7.71	385.71	500.00	0.5	500.00	1.8	0.3
5000	500	333.33	1800	3.6	10.8	900.00	833.33	0.5	900.00	3.0	0.57

Rev= revolution min= minimum

The proposal modifies current Handbook 44 language to redefine the maximum allowable change of zero that is more appropriate for the master weight totalizer.

The Southern Weights and Measures Association supported the WWMA proposal as written.

The Committee recognized that the proposal was the result of work by the Belt-Conveyor Scale Technical Seminar representatives, the NIST Technical Advisor to the Seminar, and the WWMA. The Committee made the proposal a voting item.

The Belt-Conveyor Scale Technical Seminar participants originally recommended use of tolerances expressed in scale divisions because it was consistent with practices in the NIST Handbook 44 Scales Code and possibly less confusing for officials and service agents. However, industry noted that use of a tolerance that is based on a specific number of divisions is not appropriate, and all references to tolerances expressed in scale divisions should be removed from the proposal. NIST WMD agreed with this position and believes that tolerances in terms of a relative percentage error are correct and consistent with OIML recommendations for belt-conveyor scales and similar instruments that weigh dynamically.

The Committee agreed with comments from industry and concluded that the use of a tolerance that is based on a specific number of divisions results in a value that does not correspond to variances in the test duration. A percentage tolerance value can be calculated regardless of the test duration. Consequently, the proposal was modified to remove all references to tolerance values in scale divisions.

321-4 VC N.3.1.4. Check For Consistency of the Conveyor Belt Along Its Entire Length

(This item was adopted.)

Source: Western Weights and Measures Association (WWMA)

Recommendation: Modify paragraph N.3.1.4. as follows:

> **N.3.1.4. Check For Consistency of the Conveyor Belt Along Its Entire Length. -** After a zero-load test with flow rate filtering disabled, the totalizer shall not change more than **±** three scale divisions from its initial indication during one complete belt revolution.
> (Added 2002) **(Amended 2004)**

Discussion: The intent of paragraph N.3.1.4. is to ensure that the conveyor belt is consistent in weight throughout its entire length. To meet this requirement, a belt must be the same size and thickness throughout its entire length. The types of splices, belt material, and construction are a major contributing factor to maintaining uniform belt weight. During the stability tests, adjustments are made to the scale totalizer to average the entire belt weight to provide a zero reading over complete revolutions of the belt. The belt should not have variances large enough to affect the tolerance of the weighed load because a material test load seldom fully captures a complete revolution of the belt and is not able to use the same averaging process that occurs during the stability tests.

Different interpretations exist over the true value of three scale divisions. The addition of the "±" (plus or minus) symbol will ensure that all officials and commercial operators are reading, interpreting, and applying the requirement consistently.

The Southern and Western Weights and Measures Associations supported the proposal as written.

The Committee received additional industry support for the proposal as written. The Committee recognized that the proposal was the result of work by the NIST Belt-Conveyor Scale Technical Seminar representatives, the NIST Technical Advisor to the Seminar, and the WWMA. Based on its review of the issue and after hearing only favorable comments, the Committee recommended the proposal for a vote.

321-5 VC T.3.1.1. Effect on Zero-Load Balance

(This item was adopted.)

Source: Western Weights and Measures Association (WWMA)

Recommendation: Modify paragraph T.3.1.1. as follows:

> **T.3.1.1. Effect on Zero-Load Balance. -** The zero-load indication shall not change by more than ~~**0.07**~~ **0.035** % of the rated capacity of the scale (without the belt) for a change in temperature of 10 °C (18 °F) at a rate not to exceed 5 °C (9 °F) per hour.
> **(Amended 2004)**

Discussion: The current 0.07 % tolerance for change in the zero-load indication was originally added to paragraph T.3.1.1. in 1986 to ensure consistency between NIST Handbook 44 and R 76 Non-Automatic Weighing Instruments. The 0.07 % value was recognized prior to the 1994 edition of R 50 Continuous Totalizing Automatic Weighing Instrument, which unlike the 1980 edition of R 50 it superseded, includes influence factor testing.

The proposal amends paragraph T.3.1.1. to reduce the allowable variation because of temperature effect on zero-load balance to harmonize the requirements with the most current edition of OIML R 50. The appropriate tolerance value for the effect of temperature on zero-load balance for a belt-conveyor scale is 0.035 %. Modification of the tolerance would require reevaluation of existing data for devices with "Active" NTEP Certificates of Conformance to ensure those scales meet the more stringent tolerance. Manufacturers contacted about the possibility of the proposal requiring NTEP to reevaluate existing test data agreed that aligning requirements with international standards held a higher priority and also indicated the proposed tolerances can easily be met.

The WWMA and Southern Weights and Measures Association supported the proposal as written. The WWMA acknowledged the proposal is a retroactive requirement. The WWMA agreed that the proposal may require a reevaluation of existing data for devices with "Active" Certificates of Conformance.

The Committee received additional industry support for the proposal as written. The Committee recognized that the proposal was the result of work by the NIST Belt-Conveyor Scale Technical Seminar representatives, the NIST Technical Advisor to the Seminar, and the WWMA. Based on its review of the issue and after hearing only favorable comments, the Committee recommended the proposal for a vote.

321-6 VC UR.2.2.(b) Conveyor Installation; Live Portions of Scale

(This item was adopted.)

Source: Western Weights and Measures Association (WWMA)

Recommendation: Modify paragraph UR.2.2.(b) as follows:

UR.2.2. Conveyor Installation

(b) Live Portions of Scale. - All live portions of the scale shall be protected ~~**by**~~**with** appropriate guard devices **and clearances, as recommended by the scale manufacturer,** to prevent accidental interference with the weighing operation. **Also, see UR. 3.2.**
(Amended 2004)

Discussion: Existing installation requirements only provide guidelines for using guards to prevent objects from obstructing the live portions of the scale. Adequate clearance for live portions of the scale is equally important to prevent materials or other objects from jamming or impeding the free motion of moving components of metrological criticality.

In the period following a routine installation, it may become evident that scale components and/or the scale structure may need more clearance due to the physical properties of materials or other environmental factors at the site. A user requirement is necessary since installers may not anticipate the future influence of these factors on the device's performance.

The WWMA heard comments in support of this item from a manufacturer and user. The WWMA further modified the proposal to reduce any ambiguity and emphasize compliance with corresponding installation and operation requirements in General Code paragraphs G-UR.2.1. Installation and G-UR.3.1. Method of Operation.

The Southern Weights and Measures Association supported the proposal as written.

The Committee received additional industry support for the proposal as written. The Committee recognized that the proposal was the result of work by the Belt-Conveyor Scale Technical Seminar representatives, the NIST Technical Advisor to the Seminar, and the WWMA. Hearing no opposition, the Committee made the proposal a voting item.

321-7 VC UR.3.2.(b) Maintenance

(This item was adopted.)

Source: Western Weights and Measures Association (WWMA)

Recommendation: Add a new paragraph UR.3.2.(b) as follows:

UR.3.2. Maintenance. - Belt-conveyor scales and idlers shall be maintained and serviced in accordance with manufacturer's instructions and the following:

(a) The scale and area surrounding the scale shall be kept clean of debris or other foreign material that can detrimentally affect the performance of the system.

(b) There shall be provisions to ensure that weighed material does not adhere to the belt and return to the weighing area.
(Added 2004)

Renumber existing paragraphs UR.3.2.(b) through UR.3.2.(e) to become UR.3.2.(c) through UR.3.2.(f).

Discussion: This proposal is intended to prevent the re-circulation of previously weighed material that has accumulated on the belt. The existing user requirements for belt maintenance only require clean up or removal of debris or foreign material. When the material that is being weighed as a saleable commodity is allowed to stick or freeze to a conveyor belt, then the true weight of delivered product determined by the scale can be affected since the weighed material adhering to the belt may continue to be reweighed by the scale. Current requirements do not include specific language to address this concern. Some possible examples of mechanisms that can be used to prevent material from adhering to the belt are a belt scraper installed at the head-pulley and/or a secondary scraper elsewhere on the conveyor belt system.

The WWMA agreed with comments it heard in support of this item from a manufacturer and user.

The Committee received additional industry support for the proposal as written. The Committee recognized that the proposal was the result of work by the NIST Belt-Conveyor Scale Technical Seminar representatives, the NIST Technical Advisor to the Seminar, and the WWMA. Based on its review of the issue and after hearing only favorable comments, the Committee recommended the proposal for a vote.

322 AUTOMATIC BULK WEIGHING SYSTEMS

322-1 I Tolerances

Source: Carryover Item 322-1. This item originated from the Northeastern Weights and Measures Association (NEWMA) and first appeared on the Committee's 2002 agenda.

Recommendation: Delete paragraphs T.1.4., T.2., T.2.1, T.3.2. and T.3.3. as follows:

~~T.1.4. To Tests Involving Digital Indications or Representations. - To the tolerances that would otherwise be applied, there shall be added an amount equal to one-half the value of the scale division. This does not apply to digital indications or recorded representations that have been corrected for rounding using error weights.~~

~~T.2. Minimum Tolerance Values. - The minimum tolerance value shall not be less than half the value of the scale division.~~

~~T.2.1. For Systems used to Weigh Construction Materials. - The minimum maintenance and acceptance tolerance shall be 0.1 % of the weighing capacity of the system, or the value of the scale division, whichever is less.~~

~~T.3.2. For Systems used to Weigh Grain. - The basic maintenance tolerance shall be 0.1 % of test load.~~

~~T.3.3. For all Other Systems. - The basic maintenance tolerance shall be 0.2 % of test load.~~

Renumber paragraph T.3. and renumber and modify T.3.1. as follows:

T.~~3~~.2. Basic Tolerance Values.

T.~~3~~.2.1. Acceptance Tolerance. - The basic acceptance tolerance shall be one-half the basic maintenance tolerance**, but never less than 1 division.**

Add new paragraphs T.2.2., T.2.3., and T.2.3.1. and Table 1. and Table 2. as follows:

T.2.2. General. - The tolerance applicable to devices not marked with an accuracy class shall have the tolerances applied as specified in Table 1. below.

Table 1. Tolerance for Unmarked Scales			
Type of Device	**Tolerance**	**Decreasing Load Multiplier**	**Other applicable Requirements**
Grain Hoppers	**Class III, T.2.3 (table 2)**	**1.0**	**T.2.1., T.2.3.1**
Other Systems	**Class III L, T.2.3 (table 2)**	**1.0**	**T.2.1., T.2.3.1**

T.2.3. Tolerances Applicable to Devices Marked III or III L.

T.2.3.1. Maintenance Tolerance Values - The maintenance tolerance values are specified in Table 2 below.

Table 2. Maintenance Tolerance for Marked Scales (All values in this table are in scale divisions) Tolerance in scale divisions				
	1	**2**	**3**	**5**
Class	**Test Load**			
III	**0 – 500**	**501 - 2000**	**2001 - 4000**	**4001 +**
III L	**0 – 500**	**501 - 1000**	**(Add 1d for each additional 500 d or fraction thereof)**	

Add a new footnote to Section 2.20 Scales Code Table 1.1. Tolerances for Unmarked Scales as follows:

[X] Automatic bulk weighing systems see Section 2.22 for specifications and tolerances.

Discussion: Since 2002, the Committee has considered a proposal to change the automatic bulk weighing systems tolerances from a percentage basis to division values, which are based on the device's accuracy class. The proposal was intended to align tolerances in the Automatic Bulk Weighing Systems (ABWS) Code and the Scales Code.

The Committee has kept the proposal as an information item to allow interested parties sufficient time to work through issues surrounding the permissible system errors and other concerns. The U.S. Grain Inspection, Packers and Stockyard Administration (GIPSA) indicated opposition to the proposed tolerances because of concerns about the allowable cumulative error in a system's performance. GIPSA also noted that NEWMA indicated that some asphalt and cement plants use hopper scales that are considered ABWS by officials because these devices are capable of weighing single and multiple drafts, while other jurisdictions classify these devices as hopper scales, which are held to different tolerances. During past discussions, the Committee questioned whether training would help clarify any confusion that exists over which systems fall under the ABWS Code. The Committee noted that a hopper modified to include a controller and is only capable of weighing several drafts is an automated hopper, not an ABWS.

Grain Inspection, Packers and Stockyard Administration (GIPSA) Position

GIPSA submitted the following position to the Committee for consideration. In 1986 when the ABWS Code was established those systems were recognized as a special type and design. The tolerances for grain scales in this code were kept as a percentage so they would be proportional throughout the entire test load. The proposed step tolerance structure is not proportional throughout the system's entire weighing range and would double the allowable tolerance for test loads in some scale configurations. GIPSA believes the proposed structure might encourage scale owners to inappropriately select a scale configuration that permits the greater tolerance. Furthermore under the proposed step tolerance structure, if some weights and measures jurisdictions do not apply the tolerance to the grain and test weights (test load) when conducting substitution tests, then the allowable error doubles up through the entire system's capacity.

Since 1986, the ABWS Code percentage tolerance for grain scales has served the grain industry well and there has not been any interest in changing the tolerance structure. In view of GIPSA's 17-year history of successful implementation of the ABWS Code in grain scale applications and the high level of understanding and acceptance of

the code, GIPSA believes that the rationale behind NEWMA's proposal does not warrant a change to grain scale tolerances. GIPSA provided three comparison tables to demonstrate its position. The tables are intended to show a comparison of a 0.1 % tolerance and Table 6 Class III tolerance applied to a 120 000 lb x 20 lb and 50 000 lb x 10 lb device, given a specific amount of test weights and using the substitution test method during the increasing load test.

GIPSA Comparison of 0.1 % Tolerance to Accuracy Class III Tolerances
120 000 lb x 20 lb ABWS

Indicated Grain Weight (lb)	Error In Grain Weight (lb)	Actual Grain Weight (lb)	Test Weight (lb)	Indicated Weight (lb)	Error for Indicated Weigh-ment (lb)	0.1 % Tolerance on Test Weights (lb)	Error on Accum-ulated Test Load (lb)	0.1 % Tolerance on Accumu-lated Test Load (lb)	**n**	Class III Tolerance On Test Weights (lb)	Class III Tolerance on Accumulated Test Load (lb)
0	0	0	12000	11980	-20	20	-20	20	600	40[b]	40[b]
11980	-20	12000	12000	23960	-20	20	-40[a]	24	1200	40[b]	40[b]
23960	-40	24000	12000	35960	0	20	-40[a]	36	1800	40[b]	40[b]
35960	-40	36000	12000	47980	+20	20	-20	48	2400	40[b]	60[b]
47980	-20	48000	12000	60000	+20	20	0	60	3000	40[b]	60
60000	0	60000	12000	72000	0	20	0	72	3600	40[b]	60[c]
72000	0	72000	12000	84020	+20	20	+20	84	4200	40[b]	100[b]
84000	+20	83980	12000	96000	0	20	+20	96	4800	40[b]	100[b]
96020	+20	96000	12000	108040	+20	20	+40	108	5400	40[b]	100[c]
107900	+40	107860	12000	119920	+20	20	+60	120	6000	40[b]	100[c]

[a] Error exceeds the current allowable 0.1 % tolerance
[b] Value expressed as an Accuracy Class III tolerance is greater than the current ABWS Code 0.1 % tolerance
[c] Value expressed as an Accuracy Class III tolerance is less than the current ABWS Code 0.1 % tolerance

GIPSA Comparison of 0.1 % Tolerance to Accuracy Class III Tolerances
50 000 lb x 10 lb ABWS

Indicated Grain Weight (lb)	Error In Grain Weight (lb)	Actual Grain Weight (lb)	Test **W**eight (lb)	Indicated Weight (lb)	Error for Indicated Weigh-ment (lb)	0.1 % Tolerance on Test Weights (lb)	Error on Accum-ulated Test Load (lb)	0.1 % Tolerance on Accumu-lated Test Load (lb)	**n**	Class III Tolerance On Test Weights (lb)	Class III Tolerance on Accumulated Test Load (lb)
0	0	0	5000	5010	+10	10	+10	10	500	10	10
5010	+10	5000	5000	10010	0	10	+10	10	1000	10	20[b]
10020	+10	10010	5000	15000	-20[a]	10	-10	15	1500	10	20[b]
15020	-10	15030	5000	20020	0	10	-10	20	2000	10	20
20020	-10	20030	5000	25010	-10	10	-20	25	2500	10	30[b]
25030	-20	25050	5000	30010	-20[a]	10	-40[a]	30	3000	10	30
30030	-40	30070	5000	35030	0	10	-40[a]	35	3500	10	30[c]
35030	-40	35070	5000	40030	0	10	-40	40	4000	10	30[c]
40040	-40	40080	5000	45040	0	10	-40	45	4500	10	50[b]
45040	-40	45080	5000	50030	-10	10	-50	50	5000	10	50

[a] Error exceeds the current allowable 0.1 % tolerance
[b] Value expressed as an Accuracy Class III tolerance is greater than the current ABWS Code 0.1 % tolerance
[c] Value expressed as an Accuracy Class III tolerance is less than the current ABWS Code 0.1 % tolerance

GIPSA Comparison of 0.1 % Tolerance to Accuracy Class III Tolerances For Typical ABWS Used in Grain Weighing			
Scale Capacity x division	Test Load (lb)	Current Handbook 44 Tolerance (lb)	Proposed Accuracy Class III Tolerances [accumulated test load tolerance] (lb)
5,000 lb x 0.5 lb	500	0.5	1
	5,000	5	2.5 [10]
5,000 lb x 1 lb	500	1	1
	5,000	5	5 [10]
5,000 lb x 2 lb	500	2	2
	5,000	5	6 [20]
10,000 lb x 1 lb	1,000	1	2
	10,000	10	5 [20]
10,000 lb x 2 lb	1,000	2	2
	10,000	10	10 [20]
10,000 lb x 5 lb	1,000	5	5
	10,000	10	10 [50]
20,000 lb x 2 lb	2,000	2	4
	20,000	20	5 [40]
20,000 lb x 5 lb	2,000	5	5
	20,000	20	15 [50]
30,000 lb x 5 lb	3,000	5	10
	30,000	30	25 [100]
30,000 lb x 10 lb	3,000	10	10
	30,000	30	30 [100]
50,000 lb x 5 lb	5,000	5	10
	50,000	50	25 [100]
50,000 lb x 10 lb	5,000	10	10
	50,000	50	50 [100]
50,000 lb x 20 lb	5,000	20	20
	50,000	50	60 [200]
75,000 lb x 10 lb	7,500	10	20
	75,000	75	50 [200]
75,000 lb x 20 lb	7,500	20	20
	75,000	75	60 [200]
100,000 lb x 10 lb	10,000	10	20
	100,000	100	50 [200]
100,000 lb x 20 lb	10,000	20	20
	100,000	100	100 [200]
100,000 lb x 50 lb	10,000	50	50
	100,000	100	100 [500]
120,000 lb x 20 lb	12,000	20	40
	120,000	120	100 [400]
120,000 lb x 50 lb	12,000	50	50
	120,000	120	150 [500]

Western Weights and Measures Association (WWMA) Position

The WWMA remains concerned about the potential effects of the cumulative errors associated with the proposed step tolerances and continues to recommend that this item be withdrawn.

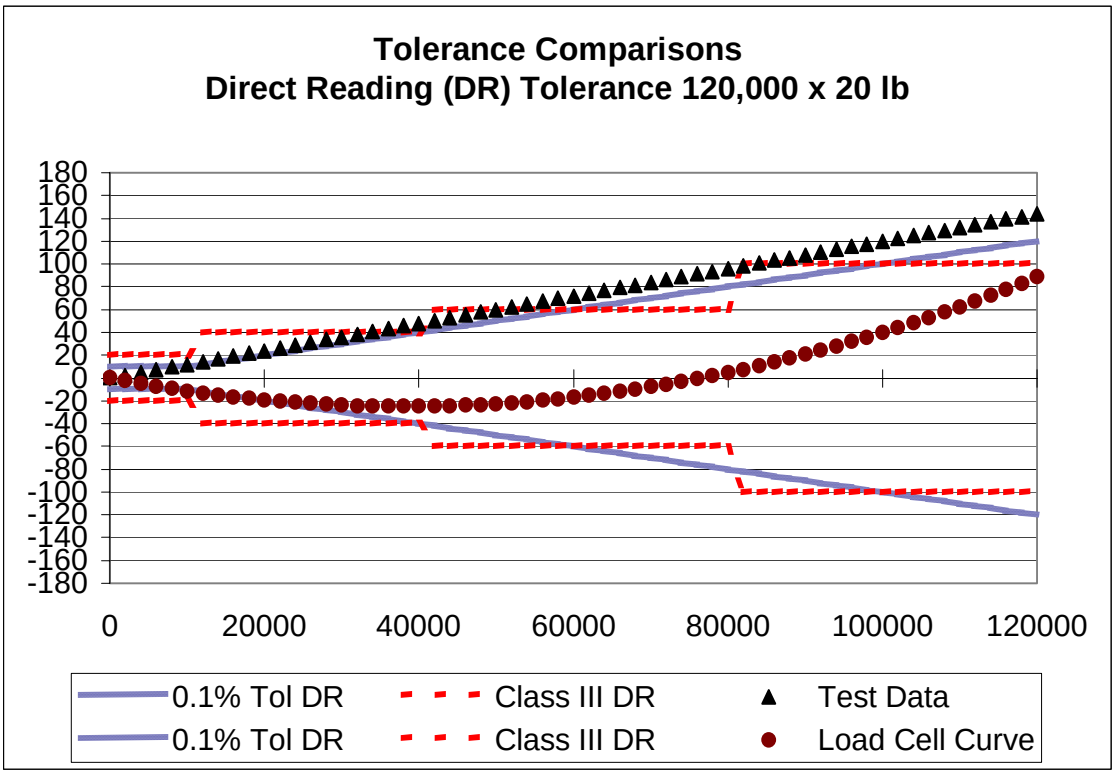
Northeastern Weights and Measures Association (NEWMA) Position

NEWMA does not intend the proposal to require that operators of grain hopper scales replace their scales. NEWMA indicated there are apparent similarities between a 0.1 % and Accuracy Class III tolerance structures. NEWMA finds the tolerance structures are closely aligned, yet slightly different at various points. Consequently, it will always be possible to cite borderline examples where the test results at selective test loads may produce differing "pass" or "fail" results on a particular scale. This difference can work both ways where application of percent tolerances may pass a scale when Class III tolerances would fail that same device and vice versa.

NEWMA believes the 0.1 % tolerance structure in the current ABWS Code emphasizes accuracy primarily at the device's lower capacity ranges. Manufacturers may indicate they are only concerned with a device's performance at 500 d because if the device can pass at that point then it will pass throughout its entire capacity range. In contrast, the Class III tolerance structure places an emphasis on accuracy at the higher scale capacities, which is typically where the scale will be used. For example, at 4000 d the Class III tolerance is actually 1 d tighter than the 0.1 % tolerance. NEWMA finds these differences to be minor.

The concerns heard in 1986 about a less stringent tolerance for loads slightly above 500 d are not the same today because officials know how to properly conduct a substitution test. This is due, in part, to work in 2003 to clarify the definition for substitution test.

NEWMA provided the graph shown below to demonstrate the slight differences in the scale tolerance structures. The graph includes a plotted scale error of 0.12 %. NEWMA notes that it is unlikely that either tolerance structure would result in a failure rate until the test load exceeds 50 000 lb. The graph also includes a "load cell curve" that often appears on high resolution electronic scales like those in the GIPSA examples. NEWMA contends that, if you examine the population rather than the individual scale, the overall outcome of a test will be the same in the long run for both tolerance structures. It also is unlikely that device users could take advantage of the tolerance if adjustments are made as close as practicable to zero error.



NEWMA also contends that there is no significant difference in the design of a manual hopper scale or a hopper scale used in an ABWS. NEWMA does not see manufacturers offer two different models of hopper or use different load cells based on whether or not a device is evaluated under the Scales Code or ABWS Code. History seems to indicate that the 0.1 % tolerance was retained in the ABWS Code in 1986 not because these were unique devices, but primarily because it was too great of a change for many at that time. History also indicates that the 5 d tolerance step for Accuracy Class III was a compromise to those who did not want to lose the 0.1 % tolerance structure and the use of scales with small division sizes. NEWMA believes that in 1986 a majority of ABWSs were mechanical analog devices, whereas today they are predominantly electronic.

NEWMA noted that the change in applicable tolerances from 0.1 % tolerance to an Accuracy Class tolerance structure did not seem to pose a significant problem for a large number of other weighing devices. Between 1990 and 1993, the NCWM made a number of changes to the Scales Code Table T.1.1. Tolerances for Unmarked Scales. These changes brought most of the unmarked scales, initially grandfathered in 1986 at a 0.1 % tolerance, under the Class III tolerance structure. As part of those changes the old decreasing load multiplier was reduced from 1.5 to 1.0. NEWMA does not remember significant increase in device rejections following these transition periods.

NEWMA cites the major reason for its proposal is to make the application of tolerances easier for the inspector. NEWMA finds that applying a percent tolerance is difficult and somewhat subjective, since the official is faced with the difficulty in understanding and correctly applying the minimum tolerance and in dealing with rounding errors at intermediate test loads. NEWMA believes that, if polled any group of officials and asked them to make a tolerance chart for any given ABWS device, you will probably get many different answers. NEWMA notes that in GIPSA's first example there is a tolerance of 40 lb for a 24 000 lb test load. However, the actual tolerance is 34 lb, if using direct reading. Should one round up or round down? What if the test load is 20 000 lb with a 30 lb tolerance, which

is right at the break point between graduations? In this instance is the tolerance 20 lb or 40 lb? Any confusion is eliminated under the proposed Accuracy Class tolerance structure.

NEWMA offers what it believes is one more compelling reason to move to Class III tolerance and that is international trade. The NCWM is embarking on a careful effort to consider harmonizing U.S. requirements with OIML requirements. NEWMA believes that all U.S. regulatory agencies should be part of this process to get the United States aligned with the rest of the world. If the U.S. system is better, then we should work together to change OIML standards. If OIML requirements are as good as U.S. requirements, then there is compelling reason under the OIML Treaty to be part of the world community. Adopting Class III Tolerances would bring the United States closer to international standards. Harmonization not only affects the sale of measuring devices, but also their use. The United States exports a great deal of grain to the world. Why shouldn't the United States and the rest of the world have a single standard to verify the measurement of grain at all levels of commerce.

NEWMA welcomes the opportunity for more discussion with the S&T Committee and GIPSA. NEWMA strongly believes that the very minor differences in tolerance applications on a few borderline cases does not justify having a unique code for a device that is identical in design and performance to devices evaluated under the Scales Code. Anyone wishing to discuss this proposal with NEWMA should contact Bill Wilson (Clinton County, New York) at 518-565-4681, by fax at 518-565-4694, or by e-mail at wilsonperu@aol.com or Ross Andersen (New York) at 518-457-3146, by fax at 518-457-5693, or by e-mail at ross.andersen@agmkt.state.ny.us.

NCWM S&T Committee Position

The Committee wants to stress that a system must meet all ABWS Code specifications such as interlocks and overfill sensors as well as performance requirements. There is ongoing work to harmonize many U.S. requirements with OIML standards; however, R 107 Discontinuous Totalizing Automatic Weighing Instruments (Totalizing Hopper Weighers), unlike the ABWS Code, requires a material test. The U.S. and OIML procedures for substitution tests consider the use of error weights to determine the scale's true performance and to avoid introducing uncertainties in the test process. If error weights are not used, the potential does exist for introducing additional error when the known test load falls between tolerance break points in the accuracy class structure.

The Committee heard testimony from GIPSA that all issues that might arise from the proposal have not been examined, especially those affecting the grain industry. GIPSA understands the need to harmonize U.S. and OIML requirements, but recommended a closer examination of the grain industry's concerns. The Committee believes that a U.S. National Work Group (USNWG) should be given serious consideration as a possible forum to work on suitable ABWS tolerances. USNWGs bring public and private sector representatives together that have experience and expertise in a particular device area to work to resolve items on a limited and device specific agenda. NIST USNWGs have made great strides and had multiple successes in tackling many device specific issues. The Committee decided to keep the proposal an information item to allow GIPSA, NEWMA, the grain industry, and all other parties affected by the proposed changes to the ABWS tolerances additional time to compare data and come to an amendable and appropriate solution for ABWS tolerances.

For more background information, refer to the 2002 and 2003 S&T Final Reports.

324 AUTOMATIC WEIGHING SYSTEMS

324-1 V Tentative Status of the Automatic Weighing Systems Code

(This item was adopted.)

Source: Carryover Item 324-1. (This item originated from the Southern Weights and Measures Association (SWMA) and first appeared on the Committee's 2002 agenda.)

Recommendation: Modify the Automatic Weighing Systems Code as shown in Appendix B and change the status of the code from "tentative" to "permanent".

Discussion: Since 2002, the Committee has considered a proposal to change the status of the Automatic Weighing Systems (AWS) Code from "tentative" to "permanent" to provide up-to-date appropriate requirements that can be enforced by weights and measures officials. The item was maintained as an information item on the Committee's agenda to provide time for the AWS Working Group to resolve issues with the limits on units of measurement, inconsistencies in the text, and laboratory tests. The Committee recognized that, although the AWS Working Group addressed many issues, industry still had concerns about devices that comply with NIST Handbook 44, but generate packages that do not meet NIST Handbook 133 requirements for net content.

At its September 2003 Annual Technical Conference, the WWMA heard comments from manufacturers that continue to oppose changing the current status of the tentative code because of allowable device errors permitted in Handbook 44 that may present inconsistencies with package lot requirements in Handbooks 130 and 133. A scale that complies with Handbook 44 accuracy requirements, when used for packaging, may produce package lots that do not meet allowable variance restrictions on net contents under Handbook 133. The manufacturers recommended further work by the AWS Working Group to resolve the remaining issues. The WWMA considered a proposal to amend the application of the AWS code exclusively to automatic weigh-labelers used in USDA facilities, but concluded that this proposed solution would not eliminate the concerns about packages checked at the point-of-pack. The WWMA recommended that this item remain informational.

During the January 2004 NCWM Interim Meeting, the Committee reviewed a proposal to amend the AWS Code that included modifications recommended by the AWS Working Group as well as language that addressed manufacturers" concerns expressed at the WWMA Annual Technical Conference. Manufacturers indicated that with minor changes to this alternate proposal the AWS Code is ready for permanent status. The Committee agreed that the alternate proposal should be included as part of this proposal to change the code status to permanent. The alternate proposal to modify the AWS Code is included in Appendix B. The Committee recognized that the AWS Working Group must be balloted on modifications recommended by manufacturers. The Committee asked that the NIST Technical Advisor to the AWS Working Group report on the results of the work group's ballot and any further modifications beyond editorial changes become separate voting items at the July 2004 NCWM Annual Meeting.

During the 2004 NCWM Annual Meeting, the Committee heard that the AWS Working Group ballot result was 8 in favor to 1 against the alternate proposal. The Scale Manufacturers Association (SMA) supported the proposal as modified by the AWS Working Group. The Committee agreed that it was acceptable to remove NTEP procedures from Handbook 44 and make that information available to the type evaluation laboratories in the upcoming 2005 edition of NCWM Publication 14.

For more background information, refer to the 2002 and 2003 S&T Final Report.

330 LIQUID-MEASURING DEVICES

330-1 VC S.2.2.1. Multiple Measuring Elements With a Single Provision for Sealing

(This item was adopted.)

Source: Carryover Item 330-1. (This item originated from the National Type Evaluation Technical Committee (NTETC) Measuring Sector and first appeared on the Committee's 2003 agenda.)

Recommendation: Add a new paragraph to NIST Handbook 44, Section 3.30. Liquid-Measuring Devices S.2.2.1. Multiple Measuring Elements With a Single Provision for Sealing as follows:

S.2.2.1. Multiple Measuring Elements with a Single Provision for Sealing. - A change to the adjustment of any measuring element shall be individually identified.
[Nonretroactive as of January 1, 2005]

Note: Examples of acceptable identification of a change to the adjustment of a measuring element include but are not limited to:

(a) a broken, missing, or replaced physical seal on an individual measuring element,

(b) a change in a calibration factor for each measuring element,
(c) display of the date of or the number of days since the last calibration event for each measuring element, or
(d) a counter indicating the number of calibration events per measuring element.

Background/Discussion: At its September 2003 Meeting, the Western Weights and Measures Association (WWMA) expressed concern that the integrity of all adjustments protected by the security means is lost when a physical security seal is removed, replaced, broken, or damaged. The WWMA recommended that this item remain informational until the NTETC Measuring Sector addressed the WWMA concerns.

At its October 2003 Meeting, the NTETC Measuring Sector modified the proposed language as shown above and agreed to forward it to the NCWM S&T Committee for consideration at the 2004 NCWM Interim Meeting.

At its October 2003 Meeting, the SWMA supported the proposal as modified by the 2003 NTETC Measuring Sector and agreed to recommend to the NCWM S&T Committee that it consider the proposal as a voting item for the 2004 NCWM Annual Meeting.

At the 2004 NCWM Interim Meeting, the Committee received comments from two weights and measures officials regarding the situation in which performance tests are conducted on a retail motor-fuel dispenser (RMFD) with multiple measuring elements and only a single sealing mechanism for all the measuring elements. [This, extra time and effort is required to perform a reinspection of the dispenser.] If one or more of the measuring elements fails the initial test and requires adjustment, at the time of reinspection, the field official has no way of knowing which measuring elements were actually adjusted and must perform at least an audit test on all of the measuring elements to verify that only those elements rejected on the initial inspection have been adjusted. The manufacturer of RMFDs that presently utilize this sealing option informed the Committee that his company has developed a means to indicate to field officials which measuring elements have been adjusted between an initial inspection and the reinspection of a rejected dispenser based on the requirements in the proposal. The Committee agreed to move the item forward, with a nonretroactive enforcement date of January 1, 2005, for a vote at the 2004 NCWM Annual Meeting.

At their May 2004 meetings, the CWMA & NEWMA supported this item as presented.

At the 2004 NCWM Annual Meeting the Committee heard no opposition to this item and agreed to recommend the item for a vote.

For more background information, refer to the 2003 S&T Final Report.

330-2 VC S.4.4.2. Location of Marking Information; Retail Motor-Fuel Dispensers

(This item was adopted.)

Source: NIST Weights and Measures Division

Recommendation: Modify NIST Handbook 44, Section 3.30. Liquid-Measuring Devices S.4.4.2. Location of Marking Information; Retail Motor-Fuel Dispensers (RMFD) as follows:

S.4.4.2. Location of Marking Information; Retail Motor-Fuel Dispensers. - *The required marking information in the General Code, Paragraph G-S.1. shall appear as follows:*

(a) ~~*Placement of this information shall not be on a portion of the device that can be readily removed or interchanged without the use of a tool separate from the device.*~~
shall be within 24 to 60 inches from the base of the dispenser;

(b) ~~*The information shall appear 24 to 60 inches from the base of the dispenser when placed on the outside of the device.*~~
may be internal and/or external provided the information is permanent and easily read;

(c) ~~***When placed behind an access door or panel the information shall appear 24 inches to 60 inches from the base of the dispenser in a readily legible position. The use of a dispenser key shall not be considered a tool separate from the device.***~~
shall be on a portion of the device that cannot be readily removed or interchanged (i.e., not on a service access panel).

Note: the use of a dispenser key or tool to access internal marking information is permitted.

[Nonretroactive as of January 1, 2003]
(Added 2002) **(Amended 2004)**

Background/Discussion: The language in the 2004 edition of NIST Handbook 44, paragraph S.4.4.2.(c) would allow the placement of G-S.1. Identification markings on a door or panel that is removable. Additionally, the wording allowed placement of marking information behind a panel that could be removed and easily exchanged through the use of a key (e.g., lower meter access panels), but did not permit the information to be located behind a panel that could be removed using other means such as a removing a screw or moving a lever. The proposed modifications to paragraph S.4.4.2. clarified the original intent, whereby it is acceptable to place G-S.1. information on permanent components located 24 inches to 60 inches above the base of the dispenser within the dispenser cabinet; however, those components could only be accessed by opening a door or panel that required the use of a key or other tool separate from the device. Scales Code paragraph S.6.2. Location of Marking Information included similar language that had allowed for access of required marking information through the use of a tool since 1989. The proposed changes make the access to marking information requirement in both codes more consistent.

At its September 2003 Meeting, the Western Weights and Measures Association (WWMA) was notified that this item would be considered at the 2003 meeting of the National Type Evaluation Committee (NTETC) Measuring Sector and heard no other comments on this item. The WWMA believed that there was insufficient justification to allow additional tools separate from the device, other than a dispenser key, to be used to access identification information and recommended that this item remain developmental.

At its October 2003 Meeting, the NTETC Measuring Sector developed an alternate proposal which clarified S.4.4.2. by reorganizing the format of the paragraph. The proposal also recommended changing the maximum height restriction for placement of the required marking information from 60 inches to 72 inches from the base of the dispenser.

At its October 2003 Meeting, the SWMA concurred with the alternate NTETC Measuring Sector proposal and agreed to forward it to the NCWM S&T Committee for consideration with the recommendation that it be a voting item on the 2004 NCWM S&T Committee's Agenda.

At the 2004 NCWM Interim Meeting, the S&T Committee received several comments indicating that changing the maximum height restriction for placement of the required marking information from 60 inches to 72 inches is unreasonable because many field officials would have difficulty reading the required information if it were placed at a height greater than 60 inches. There was general support for the language submitted by the NTETC Measuring Sector provided the current maximum height restriction at 60 inches is retained. The S&T Committee modified the proposal and agreed to present the item for a vote at the 2004 NCWM Annual Meeting in July.

At its May 2004 meeting, the Northeastern Weights and Measures Association developed an alternate proposal to the NCWM S&T to simplify and clarify the language in S.4.4.2. and submitted it to the NCWM S&T Committee with the recommendation that it be a voting item at the NCWM Annual Meeting.

At the 2004 NCWM Annual Meeting, the Committee reviewed the alternate NEWMA proposal. The Committee agreed it included the essential marking information in a more clear and concise format and recommended it as a voting item.

330-3 W Table T.2. Accuracy Classes for Liquid Measuring Devices Table T.2. Accuracy Classes for Liquid Measuring Devices Covered in Section 3.30

(This item was withdrawn.)

Source: NIST Weights and Measures Division

Recommendation: Modify Accuracy Class 0.3 in NIST Handbook 44, Section 3.30. Liquid-Measuring Devices Table T.2. as follows:

Table T.2. Accuracy Classes for Liquid Measuring Devices Covered in NIST Handbook 44 Section 3.30				
Accuracy Class	**Application**	**Acceptance Tolerance**	**Maintenance Tolerance**	**Special Test Tolerance**
0.3	Petroleum products including large capacity motor fuel devices (flow rates over 115 L/min (30 gpm))**, heated products at or greater than 50 °C asphalt at or below temperatures 50 °C, all other liquids not shown where the typical delivery is over 200 L (50 gal)	0.~~2~~15 %	0.3 %	0.45 %

Background/Discussion: Currently NIST Handbook 44 Liquid-Measuring Devices (LMD), Vehicle Tank-Meters (VTM), and Mass Flow Meters (MFM) Codes include different tolerances for 0.3 Accuracy Class meters. This creates a technical inconsistency among the codes. Tighter tolerances are applied to vehicle-mounted meters than stationary meters even though the same model of meter may be used to measure the same product in both applications. There is no technical justification for this difference. A similar inconsistency in tolerances is found between the MFM, LMD, and VTM Codes. The proposed changes would result in the application of slightly tighter acceptance tolerances to LMDs than are in the current code. An alternate approach would be to broaden the tolerances in the VTM code to correspond with the LMD and MFM codes and to provide equal benefit to all applications of the same meter.

At its September 2003 Meeting, the Central Weights and Measures Association (CWMA) concluded that further input is needed from manufacturers of the effected devices to determine whether or not they can meet tighter tolerances. The CWMA recommended that the National Type Evaluation Technical Committee (NTETC) Measuring Sector review this item and provide input.

At its September 2003 Meeting, the Western Weights and Measures Association (WWMA) was notified that this item was to be considered at the 2003 meeting of the NTETC Measuring Sector and heard no other comments on this item. The WWMA S&T Committee supports the concept that the applicable tolerance should be equivalent with respect to products measured through the same type and class of device regardless of its installation (stationary or vehicle-mounted).

At its October 2003 Meeting, the Northeastern Weights and Measures Association (NEWMA) did not support this proposal because it does not promote harmonization with OIML R 117 Measuring Systems for Liquids other than Water.

At its October 2003 Meeting, the NTETC Measuring Sector reviewed the proposed change to Table T.2. The Sector agreed with the manufacturers of turbine meters and mass flow meters attending the meeting that tightening the tolerances for those meter types was inappropriate because it would be not possible, or at least very difficult for those meter types to comply. Uniformity across the codes is not sufficient justification for changing the tolerances. Consequently, the Sector voted to oppose the proposed changes to the tolerances.

At its September 2003 Meeting, the Southern Weights and Measures Association (SWMA) S&T Committee agreed with the NTETC Measuring Sector and withdrew this item from its agenda.

At the 2004 NCWM Interim Meeting, the S&T Committee heard considerable opposition to changing the tolerances in the LMD Code. The suggestion was made that the S&T Committee begin to investigate harmonizing the Handbook 44 tolerances for liquid-measuring devices with those of Measurement Canada and those in OIML R 117 Measuring Systems for Liquids other than Water. The Committee agreed to withdraw item 330-3 from the S&T Committee Agenda for the 2004 NCWM Annual Meeting and recommended that the NCWM consider harmonizing Handbook 44 tolerances for liquid-measuring devices with Measurement Canada and OIML requirements and recommendations.

330-4 W UR.2.5. Product Identification

(This item was withdrawn.)

Source: Carryover Item 330-4. (This item originated from the National Type Evaluation Technical Committee (NTETC) Measuring Sector and first appeared on the Committee's 2003 agenda.)

Recommendation: Modify NIST Handbook 44, Section 3.30. Liquid-Measuring Devices UR.2.5. Product Storage Identification as follows:

UR.2.5. Product ~~Storage~~ Identification.

UR.2.5.1. Measuring Element Identification.

(a) The measuring elements of any multi-product dispenser shall be permanently, plainly, and visibly identified as to product being measured.

(b) When the measuring elements of any multi-product dispenser are marked by means of a color code, the color code key shall be conspicuously displayed at the place of business and be consistent with the color code used for product storage.
(Added 200X)

UR.2.5.2. Product Storage Identification.

(a) The fill connection for any petroleum product storage tank or vessel supplying motor-fuel devices shall be permanently, plainly, and visibly marked as to product contained.

(b) When the fill connection device is marked by means of a color code, the color code key shall be conspicuously displayed at the place of business.
(Added 1975 and Amended 1976 and renumbered 200X**)**

Background/Discussion: At the June 2002 NTEP Laboratory Meeting, the laboratories discussed the scenario in which field officials are sometimes not able to determine which measuring element is associated with a particular grade or blend of fuel on multi-product dispensers. In this situation, the official does not know which measuring element to mark or tag as rejected if only one grade or blend is rejected for not meeting performance requirements, since many meters no longer have visible external moving parts which indicate product flow. During the performance of a subsequent inspection following adjustment or repair of the device, the field official may be required to test all grades and blends offered through the rejected dispenser to determine that only the correct measuring element was adjusted.

At its September 2003 Meeting, the Central Weights and Measures Association (CWMA) recommended that the NCWM S&T Committee withdraw this item from its agenda because it will put an undue burden on current retailers and will ultimately not help enforcement officials.

At its September 2003 Meeting, the Western Weights and Measures Association (WWMA) heard comments that the NTETC Measuring Sector would be reviewing this item at their October 2003 meeting. The WWMA supported the

concept of the proposal and recommended that it remain an information item until the NTETC Measuring Sector provides a specific proposal to the NCWM S&T for consideration

At its October 2003 Meeting, the Northeastern Weights and Measures Association (NEWMA) recommended that this proposal should remain an information item.

At its October 2003 Meeting, the NTETC Measuring Sector determined that it no longer supports this item because it addresses an enforcement concern of only a limited number of jurisdictions and as such, does not warrant a new Handbook 44 requirement. The NTETC Measuring Sector voted to recommend that the NCWM S&T Committee withdraw this item from its agenda.

At its October 2003 Meeting, the SWMA agreed to forward a recommendation to the NCWM S&T Committee that this item be withdrawn from its agenda.

At the 2004 NCWM Interim Meeting, the Meter Manufacturers Association indicated support for this item. A large manufacturer of retail motor-fuel dispensers agreed with the CWMA and SWMA that this item would place an extra burden on device owners without providing substantial benefit to weights and measures official and should be withdrawn. The S&T Committee also agreed with the CWMA and SWMA and decided to withdraw Item 330-4 from its agenda.

For more background information, refer to the 2003 S&T Final Report.

330-5 VC Appendix D; Definition of Retail Device

(This item was adopted.)

Source: Carryover Item 330-6. (This item originated from the Western Weights and Measures Association (WWMA) and first appeared on the Committee's 1999 agenda.)

Recommendation: Modify the definition of retail devices as follows:

retail device. A **measuring** device ~~**used for**~~ **primarily utilized to measure product for the purpose of sale to the end user.**

~~**1. single deliveries of less than 378 L (100 gal),**~~

~~**2. retail deliveries of motor fuels to individual highway vehicles, or**~~

~~**3. single deliveries of liquefied petroleum gas for domestic use and liquefied petroleum gas or liquefied anhydrous ammonia for nonresale use.**~~

(Amended 1987 **and 2004**) **[3.30 and** 3.32]

Background/Discussion: Between 1999 and 2003, the Committee considered several proposals that define retail devices as those that deliver product to the final user. The Committee agreed that these proposals change the classification of some devices, previously classified as wholesale devices, to retail devices that are held to a lesser tolerance.

At the Fall 2003 regional meetings, the CWMA, SWMA, and WWMA all agreed to forward alternate proposals for definitions of the term "retail device," that defined a retail device as a device primarily used for non-resale use.

At its October 2003 Meeting, NEWMA did not support the proposal as written. NEWMA believes that the definition of a retail device should be based on quantity rather than application.

At the 2004 NCWM Interim Meeting one weights and measures official and a retail motor-fuel dispenser manufacturer's representative indicated support for the alternate proposal submitted by the SWMA. A representative from the WWMA indicated that the WWMA believes that if a device is used for any "retail" sales,

even for a single delivery, it should be considered a retail device and the applicable tolerances used. The Committee disagreed with this position. The Committee believes that weights and measures jurisdictions need some latitude in determining when a device should be classified as wholesale or retail; therefore, the Committee supported the alternative language submitted by the SWMA and agreed to present Item 330-5 for a vote at the NCWM Annual Meeting in July.

At the 2004 NCWM Annual Meeting, a railroad industry representative expressed concern that references to retail devices are currently found in only the LMD, LPG and Anhydrous Ammonia, and Mass Flow Meters Codes. The individual believed that the term could also be applied to railway track scales. A weights and measures official indicated that the definition should be applicable to only liquid measuring devices. While there may be merit to considering the use of the term for weighing devices, the term is presently used only in Handbook 44 Sections 3.30, 3.32, and 3.37; consequently the Committee presented the item for a vote as written.

For more background information, refer to the 1999 through 2003 S&T Final Reports.

331 VEHICLE-TANK METERS

331-1 V Recognition of Temperature Compensation

(This item did not pass or fail; therefore, it returns to the Committee.)

Source: Carryover Item 331-1 (This item originated from the Western Weights and Measures Association (WWMA) and first appeared on the Committee's 2000 agenda.)

Recommendation: Modify NIST Handbook 44, Section 3.31. Vehicle-Tank Meters Code (VTM) by adding the following new paragraphs to recognize temperature compensation as follows:

S.2.4. Automatic Temperature Compensation for Refined Petroleum Products.

S.2.4.1. Automatic Temperature Compensation for Refined Petroleum Products. - A device may be equipped with an automatic means for adjusting the indication and registration of the measured volume of product to the volume at 15 °C (60 °F), where not prohibited by State Law.

S.2.4.2. Provision for Deactivating. - On a device equipped with an automatic temperature-compensating mechanism that will indicate or record only in terms of liters (gallons) compensated to 15 °C (60 °F), provision shall be made for deactivating the automatic temperature-compensating mechanism so that the meter can indicate and record, if it is equipped to record, in terms of the uncompensated volume.

S.2.4.2.1. Gross and Net Indications - A device equipped with automatic temperature compensation shall indicate and record, if equipped to record, both the gross (uncompensated) and net (compensated) volume for testing purposes. If both values cannot be displayed or recorded for the same test draft, means shall be provided to select either the gross or net indication for each test draft.

S.2.4.3. Provision for Sealing Automatic Temperature-Compensating Systems. - Adequate provision shall be made for an approved means of security (e.g., data change audit trail) or physically applying security seals in such a manner that an automatic temperature-compensating system cannot be disconnected and that no adjustment may be made to the system.

S.2.4.4. Temperature Determination with Automatic Temperature Compensation. - For test purposes, means shall be provided (e.g., thermometer well) to determine the temperature of the liquid either:

(a) In the liquid chamber of the meter, or

(b) Immediately adjacent to the meter in the meter inlet or discharge line.

(Added 200X)

S.5.6. Temperature Compensation for Refined Petroleum Products. - If a device is equipped with an automatic temperature compensator, the primary indicating elements, recording elements, and recording representation shall be clearly and conspicuously marked to show that the volume delivered has been adjusted to the volume at 15 °C (60 °F).
(Added 200X)

N.4. Testing Procedures

N.4.1.3. Automatic Temperature-Compensating Systems for Refined Petroleum Products. - On devices equipped with automatic temperature-compensating systems, normal tests shall be conducted:

(a) by comparing the compensated volume indicated or recorded to the actual delivered volume corrected to 15 °C (60 °F); and

(b) with the temperature-compensating system deactivated, comparing the uncompensated volume indicated or recorded to the actual delivered volume.

The first test shall be performed with the automatic temperature-compensating system operating in the "as found" condition. On devices that indicate or record both the compensated and uncompensated volume for each delivery, the tests in (a) and (b) may be performed as a single test.
(Added 200X)

N.5. Temperature Correction for Refined Petroleum Products. - Corrections shall be made for any changes in volume resulting from the differences in liquid temperatures between the time of passage through the meter and time of volumetric determination in the prover. When adjustments are necessary, appropriate petroleum measurement tables should be used.
(Added 200X)

T.2.1. Automatic Temperature-Compensating Systems. - The difference between the meter error (expressed as a percentage) for results determined with and without the automatic temperature-compensating system activated shall not exceed:

(a) 0.4 % for mechanical automatic temperature-compensating systems; and

(b) 0.2 % for electronic automatic temperature-compensating systems.

The delivered quantities for each test shall be approximately the same size. The results of each test shall be within the applicable acceptance or maintenance tolerance.
(Added 200X)

UR.2.5. Temperature Compensation for Refined Petroleum Products.

UR.2.5.1. Automatic.

UR.2.5.1.1. When to be Used. - In a State that does not prohibit, by law or regulation, the sale of temperature-compensated product a device equipped with an operable automatic temperature compensator shall be connected, operable, and in use at all times. An electronic or mechanical automatic temperature-compensating system may not be removed, nor may a compensated device be replaced with an uncompensated device, without the written approval of the responsible weights and measures jurisdiction.

[Note: This requirement does not specify the method of sale for product measured through a meter.]

UR.2.5.1.2. Invoices. - An invoice based on a reading of a device that is equipped with an automatic temperature compensator shall show that the volume delivered has been adjusted to the volume at 15 °C (60 °F).

(Added 200X)

Discussion/Background: When this item was originally submitted, weights and measures officials indicated confusion about the specific meter applications that are covered by an NTEP Certificate of Conformance for a meter that includes the temperature-compensation feature. The WWMA acknowledged that there are jurisdictions that permit temperature compensated deliveries in applications that are not addressed by NIST Handbook 44. Other states do not allow the use of automatic temperature compensation for the delivery of products using a VTM.

At the 2003 NCWM Annual Meeting the Committee again heard comments both in favor of and opposition to the item. The vote on the item did not yield a sufficient number of aye or nay votes for the item to be accepted or defeated and therefore it returned to the Committee for further action.

At its September 2003 Meeting, the WWMA continued its strong support of this item as proposed and agreed to recommend that the NCWM S&T Committee move it forward as a voting item.

The NIST Weights and Measures Division (WMD) believes that, for consistency with the requirements for liquified petroleum gas and for uniformity throughout the industry, there should be a method of sale requirement in Handbook 130 for refined petroleum products sold using VTMs. Such a requirement would apply in states that adopt the Handbook 130 Method of Sale Regulation, provided it is not in conflict with other existing state statutes.

At the 2004 NCWM Interim Meeting, the Meter Manufacturers Association (MMA) indicated support for the proposal. One official indicated that the item should remain an information item until the Method of Sale Regulation in Handbook 130 requires the sale of petroleum products to utilize temperature correction to the standard reference temperature of 60 ºF. Another official stated that not having standards and test methods in the VTM Code of Handbook 44 creates a hardship for officials in jurisdictions where temperature compensation is allowed and utilized on VTMs delivering petroleum products and urged the NCWM to adopt this proposal. The Committee agreed to present Item 331-1 for a vote at the 2004 NCWM Annual Meeting in July.

At their May 2004, meetings the CWMA & NEWMA supported item 331-1 as proposed.

At the 2004 NCWM Annual Meeting, the MMA continued to support the proposal. Several weights and measures official indicated that a corresponding Handbook 130 requirement specifying the use of temperature compensated meters for deliveries of petroleum products using a VTM needs to be in place before this proposal moves forward.

The Committee stated its belief that the Specifications, Test Notes, Tolerances, and User Requirements contained in the proposal are technically correct and provide both the weights and measures inspector and the NTEP laboratories with the proper criteria to use when evaluating a VTM with temperature compensation capability.

The addition of this language to the VTM Code would not require, approve, nor solicit any jurisdiction to either prohibit or accept the use of temperature compensation in that jurisdiction.

The Committee further noted that the adoption of a nationally accepted method of sale for temperature compensation by all jurisdictions would not be obtainable in the foreseeable future and, thus, encouraged each jurisdiction to adopt by either statute, rule, or regulation requirements that state prohibit, permit or require temperature compensation in their jurisdiction.

The Committee agreed that there were a sufficient number of states that needed the proposal as an inspection tool to warrant adding the proposal to NIST Handbook 44 at this time without waiting for method of sale requirements to be added to NIST Handbook 130. Therefore the Committee agreed to recommend the proposal for a vote.

For additional background on this item see the 2000 through 2003 NCWM S&T Final Reports.

331-2 I N.4.2. Special Tests (Except Milk-Measuring Systems), N.4.5. Product Depletion Test, and T.5. Product Depletion Test

Source: Carryover Item 331-6. (This item originated from the Northeastern Weights and Measures Association (NEWMA) and first appeared on the Committee's 2003 agenda.)

Recommendation: Modify NIST Handbook 44, Section 3.31. Vehicle-Tank Meters (VTM) Code, paragraph N.4.2. Special Tests (Except Milk-Measuring Systems) and add new paragraphs N.4.5. Product Depletion Test and T.5. Product Depletion Test to the Vehicle-Tank Meters Code as follows:

N.4.2. Special Tests (Except Milk-Measuring Systems). - "Special" tests shall be made to develop the operating characteristics of a measuring system and any special elements and accessories attached to or associated with the device. Any test except as set forth in N.4.1. **or N.4.5.** shall be considered a special test. Special test of a measuring system shall be made ~~as follows:~~

~~(a)~~ A<u>a</u>t a minimum discharge rate of 20 % of the marked maximum discharge rate or at the minimum discharge rate marked on the device whichever is less~~;~~**.**

~~(b) To develop operating characteristics of the measuring system during a split compartment delivery~~.

N.4.5. Product Depletion Test. - The effectiveness of the vapor eliminator shall be tested by depleting the product supply and continuing until the lack of fluid causes the meter register to stop completely. The test shall be completed by switching to another compartment with sufficient product on a multi-compartment vehicle, or by adding sufficient product to a single compartment vehicle. When adding product to a single compartment vehicle, allow appropriate time for any entrapped vapor to disperse before continuing the test.
(Added 200X)

T.5. Product Depletion Test. - The difference in the delivered volumes for the normal test and the product depletion test shall not exceed 0.5 % of the equivalent of one minute of flow at the maximum rated flow rate for the system.
(Added 200X)

Alternate Recommendation: The National Type Evaluation Technical Committee (NTETC) Measuring Sector recommended modifying NIST Handbook 44, Section 3.31. Vehicle-Tank Meters paragraph N.4.2. Special Tests (Except Milk-Measuring Systems) and adding new paragraphs N.4.5. Product Depletion Test and T.5. Product Depletion Test and Table T.5. Tolerances for Product Depletion Tests to the Vehicle-Tank Meters Code as follows:

N.4.2. Special Tests (Except Milk-Measuring Systems). - "Special" tests shall be made to develop the operating characteristics of a measuring system and any special elements and accessories attached to or associated with the device. Any test except as set forth in N.4.1. **or N.4.5.** shall be considered a special test. Special tests of a measuring system shall be made ~~as follows:~~

~~(a)~~ **~~A~~**<u>a</u>t a minimum discharge rate of 20 % of the marked maximum discharge rate or at the minimum discharge rate marked on the device whichever is less~~;~~**.**

~~(b) To develop operating characteristics of the measuring system during a split compartment delivery.~~

N.4.5. Product Depletion Test. - The effectiveness of the vapor eliminator shall be tested by depleting the product supply and continuing until the lack of fluid causes the meter indication to stop completely for at least 10 seconds. If the meter indication fails to stop completely for at least 10 seconds, continue to operate the system for 3 minutes. The test shall be completed by switching to another compartment with sufficient product on a multi-compartment vehicle, or by adding sufficient product to a single compartment vehicle. When adding product to a single compartment vehicle, allow appropriate time for any entrapped vapor to disperse before continuing the test.

(Added 200X)

T.5. Product Depletion Test. - The difference in the delivered volumes for the normal test and the product depletion test shall not exceed the tolerance shown in Table T.5. and all test results shall be within applicable tolerances.

Table T.5. Tolerances For Vehicle Tank Meters (Except Milk Meters) On Product Depletion Tests	
Manufacturer's rated capacity (Maximum gpm)	**Maintenance and acceptance tolerances**
Up to 125	**125 in^3**
126-250	**200 in^3**
251-500	**300 in^3**
501 - 750	**400 in^3**
Over 751	**600 in^3**

Background/Discussion: The proposal intends to recognize that the measurement of vapor when product is depleted during the vehicle-tank meter (VTM) split compartment test (product depletion test) is a system problem and the amount of vapor measured is not related to the prover size. The proposal also requires a split-compartment test (product depletion test) for single compartment vehicles to verify the performance of the air elimination mechanism. Currently paragraph N.4.2.(b) refers only to a split-compartment delivery. The proposed tolerance structure is based on the meter's flow rate such that the tolerance for a given meter remains constant regardless of the size of the test draft.

At the 2003 NCWM Interim Meeting, NEWMA noted concerns with the current tolerances for a split compartment test (product depletion test) because VTMs that fail tests completed in a jurisdiction using 100-gallon provers are passing tests in neighboring jurisdictions that use larger provers (i.e., 200-gallon). The Committee agreed the proposal has merit because the product depletion test is necessary for vehicle-tank meters, and the proposal provides guidelines on the appropriate test conditions. Therefore, the Committee changed the status of this item from developing to an information item.

The Committee is uncertain that all sizes of vehicle-tank meters can attain the 0.5 % tolerance proposed for the difference in the test results between the normal and product depletion tests. The Committee asks for data that demonstrates the ability of VTMs to meet the proposed tolerance. The Committee recommended that NEWMA consult with Measurement Canada on its test procedures. Because tanks of different sizes drain at different rates the Committee asked NEWMA to develop guidelines for switching tanks when all tanks are not the same size.

At its September 2003 Meeting, the Western Weights and Measures Association (WWMA) heard no comments on this item. The WWMA is concerned that the proposed tolerance for product depletion tests would allow errors exceeding current applicable tolerances. Additionally, the WWMA agreed with the NCWM S&T Committee that data is needed to demonstrate that VTMs can attain the proposed tolerances. The WWMA recommended that the item remain informational pending further development by New York and the NTETC Measuring Sector.

At the October 2003 NEWMA Meeting, New York expressed concern that, in the NEWMA proposal, the product depletion test would not be considered a "special test" and that tolerances based on the agreement between the normal tests and the product depletion tests might result in accepting values outside the "special test" tolerances. Therefore, NEWMA proposed that the exemption in paragraph N.4.2. stating "that the testing set forth in paragraph N.4.5. shall not be considered a 'special test' " be removed. NEWMA also submitted the following examples of product depletion test results to further show the need for a product depletion test tolerance that is not dependent on prover size. The table assumes that error in the meter under normal test conditions is relatively linear between a 100 gal and a 200 gal test and that the actual amount of vapor passed for either test would remain approximately the same.

Examples: Product Depletion Test - Proposed

Meter Marked: 100 gpm Max/20 gpm Min				Proposed Product Depletion Agreement
Tolerances:	Acceptance	Maintenance	Special Test	
100 gal prover	0.15 gal	0.3 gal	0.45 gal	0.5 gal
200 gal prover	0.30 gal	0.6 gal	0.90 gal	0.5 gal

Sample Test Results (Maintenance Tol.): Assume linear error in normal tests and fixed passage of vapor

Error for Normal Test at 100 gal	Expected Error for Normal Test at 200 gal	Error PD Test 100 gal	Expected Error PD Test 200 gal	PD Agreement	Normal Test P/F		Special Test P/F		Proposed Prod Depletion Agreement P/F	
(gal)	(gal)	(gal)	(gal)	gal	100 gal	200 gal	100 gal	200 gal	100 gal	200 gal
0.25	0.50	-0.25	1.00	-0.50	Pass	Pass	Pass	Pass	Pass	Pass
0.00	0.00	-0.50	0.50	-0.50	Pass	Pass	Fail	Pass*	Pass	Pass
-0.25	-0.50	-0.75	0.00	-0.50	Pass	Pass	Fail	Fail	Pass	Pass
0.25	0.50	-0.45	1.20	-0.70	Pass	Pass	Pass	Pass	Fail	Fail
0.00	0.00	-0.70	0.70	-0.70	Pass	Pass	Fail	Pass*	Fail	Fail
-0.25	-0.50	-0.95	0.20	-0.70	Pass	Pass	Fail	Fail	Fail	Fail
0.25	0.50	-0.10	0.85	-0.35	Pass	Pass	Pass	Pass	Pass	Pass
0.00	0.00	-0.35	0.35	-0.35	Pass	Pass	Pass	Pass	Pass	Pass
-0.25	-0.50	-0.60	-0.15	-0.35	Pass	Pass	Fail	Fail	Pass	Pass

Sample Test Results (Acceptance Tol.): Assume linear error in normal tests and fixed passage of vapor

Error for Normal Test at 100 gal	Expected Error for Normal Test at 200 gal	Error PD Test 100 gal	Expected Error PD Test 200 gal	PD Agreement	Normal Test P/F		Special Test P/F		Proposed Prod Depletion Agreement P/F	
(gal)	(gal)	(gal)	(gal)	gal	100 gal	200 gal	100 gal	200 gal	100 gal	200 gal
0.12	0.24	-0.38	0.74	-0.50	Pass	Pass	Pass	Pass	Pass	Pass
0.00	0.00	-0.50	0.50	-0.50	Pass	Pass	Fail	Pass*	Pass	Pass
-0.12	-0.24	-0.62	0.26	-0.50	Pass	Pass	Fail	Pass*	Pass	Pass
0.12	0.24	-0.58	0.94	-0.70	Pass	Pass	Pass	Pass*	Fail	Fail
0.00	0.00	-0.70	0.70	-0.70	Pass	Pass	Fail	Pass*	Fail	Fail
-0.12	-0.24	-0.82	0.46	-0.70	Pass	Pass	Fail	Pass*	Fail	Fail
0.12	0.24	-0.23	0.59	-0.35	Pass	Pass	Pass	Pass	Pass	Pass
0.00	0.00	-0.35	0.35	-0.35	Pass	Pass	Pass	Pass	Pass	Pass
-0.12	-0.24	-0.47	0.11	-0.35	Pass	Pass	Fail	Pass*	Pass	Pass

* Provides different result from 100 gal test.

At its October 2003 Meeting, the NTETC Measuring Sector reviewed a change to Handbook 44 adopted at the 1974 NCWM which added Table 2. – Tolerances For Vehicle Tank Meters on Supply Exhaustion Tests Except Milk Meters to Section 3.31. Vehicle-Tank Meters code. The Sector agreed that an additional flow rate designation should be added to the table to recognize larger meter sizes currently manufactured, and to forward an alternate proposal to modify NIST Handbook 44, Section 3.31 Vehicle-Tank Meters to address Product Depletion Tests to the NCWM S&T Committee through the SWMA.

At its October 2003 Meeting, the SWMA concurred with the NTETC Measuring Sector's alternate proposal. The SWMA agreed to forward the proposal to the NCWM S&T Committee for consideration with the recommendation that it be a voting item on the NCWM S&T Committee's 2004 Agenda.

At the 2004 NCWM Interim Meeting, the Meter Manufacturers Association (MMA) voiced support for the intent of the alternative proposal submitted by the NTETC Measuring Sector provided T.4. is modified by removing the words "and all test results shall be within applicable tolerances." A Maryland Weights and Measures Official noted that the proposal if modified as the MMA recommends, provides a substantial change in tolerance; however, Maryland is in favor of the concept because the tolerance for a given meter is not linked to the size of the prover used for testing. A New York Official stated that a product depletion test should be viewed as the test in which a "disturbance" is introduced, similar to a test for the effect of radio frequency interference (RFI) on a scale. New York preferred a tolerance expressed as a flat percentage and suggested a tolerance of 0.5 % of the meter's marked maximum flow rate rather than the step tolerances in the proposed Table T.5. A representative from Measurement Canada indicated that there is an opportunity for the United States and Canada to harmonize the requirement for a product depletion test. Canada is currently using a tolerance of 0.25 % of the meter's marked maximum flow rate applied to the product depletion test results; however, Measurement Canada is still conducting a study to determine if the 0.25 % tolerance is appropriate. The Committee agreed that item 331-2 should remain an information item and is returning the item to the NTETC Measuring Sector for further development.

331-3 I S.2.4. Zero Set-Back Interlock

Source: Southern Weights and Measures Association (SWMA)

Recommendation: Add a new paragraph S.2.4. to Handbook 44, Section 3.31. Vehicle-Tank Meters as follows:

> ***S.2.4. Zero Set-Back Interlock, Vehicle-Tank Meters. – A device shall be so constructed that after a delivery cycle has been completed, an automatic interlock system shall engage to prevent a subsequent delivery until the indicating and, if equipped, recording elements have been returned to their zero position. [Nonretroactive as of January 1, 200X]***

Background/Discussion: At its October 2003 Meeting, the SWMA reviewed a proposal to add a specification requiring a zero set-back interlock on vehicle-tank meters as shown above. The submitter commented that this specification has been in place for retail motor-fuel dispensers for many years. Its purpose is to prevent a second party from being charged for product delivered to the first party. However, there is no requirement for interlocks on Vehicle-Tank Meters. Currently the only protection is provided by two User Requirements paragraphs, UR.2.3. Ticket in Printing Device, which prohibits the "riding of tickets" (having a ticket in the printer while the vehicle is moving from one location to another) and UR.2.1. Return of Indication Element to Zero, which requires the indications to be set to zero before a delivery. Both of these requirements are extremely difficult, if not impossible to enforce with the newer technology where printers are frequently mounted in the cab of the vehicle and are not visible to an observer outside the vehicle. The SWMA agreed to forward the proposal to the NCWM S&T Committee for consideration with the recommendation that it be a nonretroactive requirement.

At the 2004 NCWM Interim Meeting, the Meter Manufacturers Association (MMA) stated that there was a need to have the ability to make multiple deliveries at a single location or to one buyer without having to remove a delivery ticket. The MMA supported the concept of the proposal provided it was limited to devices with electronic indicators that have the ability to print more than one delivery on a single delivery ticket. Maryland Weights and Measures agreed with the MMA. The Committee agreed that the proposal should remain an information item on the S&T Agenda to allow the NTETC Measuring Sector and other interested parties time to further develop the proposal.

At the 2004 NCWM Annual Meeting, the MMA stated that a zero set-back interlock would be a desirable feature on systems with an electronic indicator; however, it is not practical to add the feature to a system with a mechanical indicator. While the proposal has merit and there appears to be some support for the concept, the Committee recognized from the comments that there are still a number of issues which need to be resolved before the proposal is ready for a vote. Consequently, the Committee referred the proposal back to the NTETC Measuring Sector for further development.

332 LPG AND ANHYDROUS AMMONIA LIQUID-MEASURING DEVICES

332-1 W UR.2.3. Vapor-Return Line

(This item was withdrawn.)

Source: Carryover Item 332-2. (This item was developed by the Southern Weights and Measures Association (SWMA) and first appeared on the Committee's 2002 agenda.)

Recommendation: Modify NIST Handbook 44, Section 3.32. LPG and Anhydrous Ammonia Liquid-Measuring Devices paragraph UR.2.3. as follows:

UR.2.3. Vapor Return Line - During any metered delivery of liquefied petroleum gas from a supplier's tank to a receiving container, there shall be no vapor-return line from the receiving container to the supplier's tank **except:**

(a) in the case of any receiving container to which normal deliveries can**not** be made without the use of such vapor-return line, or

(b) in the case of any new receiving container when the ambient temperature is ~~**below**~~ **above** 90 °F~~.~~**, or**

(c) in the case of wholesale terminal deliveries.

Background/Discussion: At its September 2001 Annual Meeting, the SWMA heard a concern from Tennessee that vapor-return lines are commonly used at LPG loading rack terminals where large capacity transports are loaded for distribution to bulk LPG dealers. At least some of the operating terminals are applying industry-derived factors that are used to credit customers for metered product that is returned as vapor to the sellers' storage tanks. Paragraph U.R.2.3.(a) provides an exception that allows the use of a vapor return line when abnormal conditions exist, such as high pressure in the receiving tank, which would prevent delivery without the use of a vapor return line. The SWMA questions whether or not bulk terminal locations fall under this exemption. The terminals where vapor-return lines are being used have insufficient pumping ability to fill the large vessels that are used to distribute LPG to bulk dealer facilities. When pumping capacity becomes an issue the condition can be remedied by installing new pumping and metering equipment which is capable of filling the large pressure vessels without a vapor-return line. Additionally, the terminals have the option of weighing the product rather than metering it. These conditions exist at LPG terminals in all regions of the United States, thus, this is not a unique situation only affecting the State of Tennessee.

SWMA agreed with Tennessee that the following options should be reviewed and the appropriateness of using vapor return lines in these LPG filling operations should be addressed:

1. Allow loading rack terminals to use vapor-return lines and review a proposal from industry on applying the vapor factor to credit the purchaser. A mean credit value may be adequate, although it has been determined that the vapor returned is not always consistent from delivery to delivery.

2. Allow a vapor meter to be installed between the receiving vessel and the seller's tanks, then convert the vapor measurements to liquid quantities and credit the purchaser.

3. Provide a consensus opinion that bulk terminal loading-rack installations meet the exception contained in paragraph UR.2.3. (a) and no action is needed by weights and measures officials.

4. Provide a consensus opinion that the conditions do not meet the exception noted in paragraph UR.2.3. and weights and measures officials should require terminals currently unable to load without vapor-return lines to take corrective action to comply with NIST Handbook 44.

Following the 2003 NCWM Interim Meeting, the Committee received recommended changes to UR.2.3. from the State of Tennessee to address the use of vapor return lines in wholesale terminal applications. The Committee agreed the proposal should remain an information item to provide the regional associations an opportunity to review and discuss Tennessee's proposal. For clarity, the Committee modified Tennessee's proposal to make the last sentence in the proposal a separate paragraph (c) as shown in the recommendation above.

At its September 2003 Meeting, the Western Weights and Measures Association (WWMA) heard no comments on this item during its open hearings. The WWMA S&T Committee expressed concerned that the proposal does not include a means for compensating for product in a vapor state that returns to the facilities' storage tank. The WWMA agreed with SWMA option number 4, in which weights and measures officials should require terminals currently unable to load without vapor-return lines to take corrective action to comply with NIST Handbook 44. The WWMA agreed to recommend that the NCWM S&T Committee withdraw this item from its agenda.

At its October 2003 Meeting, the NEWMA recommended that this proposal should remain an information item.

At its October 2003 Meeting, the SWMA did not include this item on its agenda.

At the 2004 NCWM Interim Meeting, the NIST Weights and Measures Division shared a concern with the Committee that allowing terminals to selectively use or not use a vapor return line during tank filling promotes non-uniformity in deliveries from one facility to another. The Committee expressed a belief that all parties involved in the loading of tank-trucks at the wholesale level understand the ramifications of using a vapor return line and are willing to accept transactions that require the use of a vapor return line. The Committee agreed to present Item 332-1 for a vote at the 2004 NCWM Annual Meeting in July.

At the 2004 NCWM Annual Meeting a weights and measures official expressed concern with the amount of product that can potentially be transferred from the receiving tank to the supply tank when using a vapor return line. Information provided from several sources indicated a range of potential product transfer from 2.5 % to 2.8 % of the delivered volume. The information provided during the open hearing regarding the amount of vapor displaced during the filling process convinced the Committee that selectively allowing the use of a vapor-return line during a wholesale delivery may create considerable inequity in the market place. The Committee agreed to withdraw Item 332-1 from its agenda.

358 MULTIPLE DIMENSION MEASURING DEVICES

358-1 VC S.1.6. Customer Indications and Recorded Representations, Table S.1.6. Required Information to be Provided by Multiple Dimension Measuring Systems, UR.5. Customer Information Provided, and Table UR.5. Customer Information to be Provided

(This item was adopted.)

Source: Multiple Dimension Measuring Devices Working Group

Recommendation: Modify Handbook 44 Section 5.58. Multiple Dimension Measuring Devices, paragraph S.1.6., delete the current Table S.1.6. and replace it with a new Table S.1.6., and add new paragraph UR.5. and new Table UR.5. as follows:

S.1.6. Customer Indications and Recorded Representations. - Multiple dimension measuring **devices or** systems must provide information as specified in Table S.1.6. **As a minimum, all devices or systems must be able to meet either column I or column II in Table S.1.6.** ~~**(See Table Appendix at the end of this code.)**~~ **(Amended 2004)**

~~Table S.1.6. Information to be Provided on Multiple Dimension Measuring Systems~~

~~Scenarios Ψ~~ ~~Information ∴~~	~~Scenario 1.1~~ ~~Customer present (printer only)~~	~~Scenario 1.2~~ ~~Customer present (display only)~~	~~Scenario 1.3~~ ~~Customer present (printer and display)~~	~~Scenarios 2, 3, 4~~ ~~Customer is not present.~~
~~System ID~~	~~P (only in multi-system applications)~~	~~D (only in multi-system applications)~~	~~D or P (only in multi-system applications)~~	~~P or A~~
~~Object ID~~	~~N/A~~	~~N/A~~	~~N/A~~	~~P or A~~
~~Dimensions and/or volume, units~~	~~P~~	~~D~~	~~D and P~~	~~P or A~~
~~Error indicator~~	~~P~~	~~D~~	~~D and P~~	~~N/A~~
~~Billing method~~	~~P~~	~~D~~	~~D or P~~	~~N/A~~
~~Billed weight~~	~~P~~	~~D~~	~~D or P~~	~~N/A~~
~~Total price~~	~~P~~	~~D~~	~~D or P~~	~~N/A~~
~~Dim weight (if applicable)~~	~~P~~	~~D~~	~~D or P~~	~~P or A~~
~~Scale weight (if applicable)~~	~~P~~	~~D~~	~~D or P~~	~~P or A~~
~~Tare (if applicable)~~	~~P~~	~~D~~	~~D or P~~	~~P or A~~
~~Oversized indicator~~	~~P~~	~~D~~	~~D or P~~	~~P or A~~
~~Dimensions are of smallest box~~	~~P or M~~	~~D or M~~	~~D or P or M~~	~~P or A~~
~~Billing rate or rate chart, conversion factors~~	~~A~~	~~A~~	~~A~~	~~P or A~~

~~D = DISPLAYED~~
~~A = AVAILABLE UPON REQUEST (retained for at least 30 days after invoice)~~
~~N/A: NOT APPLICABLE~~
~~P = PRINTED~~
~~M = MARKED ON THE DEVICE~~

Table S.1.6. Required Information to be Provided by Multiple Dimension Measuring Systems

Information	Column I*	Column II*		Column III
	Provided by device	Provided by invoice or other means		Provided by invoice or other means as specified in contractual agreement
		Customer present	Customer not present	
1 Device identification [1]	D or P	P	P	P or A
2 Error message (when applicable)	D or P	P	N/A	N/A
3 Hexahedron dimensions[2]	D or P	P	P	P or A
4 Hexahedron volume (if used)[2]	D or P	P	P	P or A
5 Actual weight (if used)[2]	D or P	P	P	P or A
6 Tare (if used)[2]	D or P	N/A	N/A	N/A
7 Hexahedron measurement statement [3]	D or P or M	P	P	P or G

D = DISPLAYED, P = PRINTED or RECORDED IN A MEMORY DEVICE and AVAILABLE UPON REQUEST BY CUSTOMER [4], M = MARKED, G = PUBLISHED GUIDELINES OR CONTRACTS, A = AVAILABLE UPON REQUEST BY CUSTOMER [4], N/A = NOT APPLICABLE

Notes:

1 This is only required in systems where more than one device or measuring element is being used.

2 Some devices or systems may not utilize all of these values; however as a minimum either hexahedron dimensions or hexahedron volume must be displayed or printed.

3 This is an explanation that the dimensions and/or volume shown are those of the smallest hexahedron in which the object that was measured may be enclosed rather than those of the object itself.

4 The information "available upon request by customer" shall be retained by the party having issued the invoice for at least 30 calendar days after the date of invoicing.

*** As a minimum all devices or systems must be able to meet either column I or column II.**

Hexahedron = An object with six rectangular, plane surfaces (sides).

(Amended 2004)

UR.5. Customer Information Provided. - The user of a multiple dimension measuring device or system shall provide transaction information to the customer as specified in Table UR.5.
(Added 2004)

Table UR.5. Customer Information Provided			
Information	**No contractual agreement**		**Contractual agreement**
	Customer present	**Customer not present**	
1 Object identification	**N/A**	**P**	**P or A**
2 Billing method (Scale or Dimensional weight if used)	**D or P**	**P**	**P or A**
3 Billing rate or rate chart	**D or P or A**	**P or G or A**	**P or A**
4 Dimensional weight (if used)	**P**	**P**	**P or A**
5 Conversion factor (if dimensional weight is used)	**D or P or A**	**P**	**P or G**
6 Dimensional weight statement[1] (if dimensional weight is used)	**D or P**	**P**	**P or G**
7 Total price	**P**	**P**	**P or A**

A = AVAILABLE UPON REQUEST BY CUSTOMER [2],
D = DISPLAYED,
G = PUBLISHED GUIDELINES OR CONTRACTS,
M = MARKED,
N/A = NOT APPLICABLE,
P = PRINTED

[1] This is an explanation that the dimensional weight is not a true weight but is a calculated value obtained by applying a conversion factor to the hexahedron dimensions or volume of the object.

[2] The information "available upon request by customer" shall be retained by the party having issued the invoice for at least 30 calendar days after the date of invoicing.

Hexahedron = An object with six rectangular, plane surfaces (sides).

(Table added 2004)

Background/Discussion: This proposal was developed by the NIST Weights and Measures Division at the request of the MDMD Working Group following its meeting in July 2003. The Work Group approved the proposal and agreed to forward it to the NCWM S&T Committee for consideration. The current Table S.1.6. contains not only specifications for devices or systems but also includes user requirements. The manufacturer of a device or system is responsible for assuring compliance with NIST Handbook 44 specifications. The owner or operator of a device or system is responsible for assuring that the device or system is used in a manner consistent with user requirements of Handbook 44. Separating the requirements into two separate tables would aid manufacturers, users, and weights and measures officials in determining responsibility for complying with a particular requirement. NCWM adoption of this item would aid in the effort to change the status of the Multiple Dimension Measuring Devices Code from "tentative" to "permanent."

At their Fall 2003 Meetings, the Western, and Southern Weights and Measures Associations agreed with the proposal as written. In addition, the Western Weights and Measures Association commended the MDMD Working Group for its work on this issue.

At the 2004 NCWM Interim Meeting, the Committee heard support for all items relating to the MDMD Code. The Committee also heard a suggestion to move a proposal to change the status of the code from "tentative" to "permanent" to the end of the 358 items. This change in the order of the items would insure that the status of the code would be decided after all other proposed changes to the code had been considered. The Committee agreed and reordered the items accordingly and proposed the items for a vote.

At their May 2004, meetings the CWMA & NEWMA supported this item as presented.

At the 2004 NCWM Annual Meeting, a manufacturer of multiple dimension measuring devices indicated support for agenda items 358-1 through 358-7, noting that the proposals represented sound technical requirements developed by the work group with representation from manufacturers, users, and weights and measures officials.

358-2 VC S.1.8. Indications Below Minimum and Above Maximum and Table S.4.1.b. Notes for Table S.4.1.a.; Note 7

(This item was adopted.)

Source: Multiple Dimension Measuring Devices Working (MDMD) Group

Recommendation: Modify Handbook 44 Section 5.58. Multiple Dimension Measuring Devices paragraph S.1.8. and Note 7 of Table S.4.1.b. as follows:

S.1.8. Indications Below Minimum and Above Maximum. - Except for entries of tare, when objects are smaller than the minimum dimensions identified in paragraph S.1.7. or larger than ~~**105 %**~~ **any** of the maximum dimensions **plus 9 d,** and/or **maximum** volume marked on the device **plus 9 d, or when a combination of dimensions for the object being measured exceeds the measurement capability of the device**, the indicating or recording element shall either:

(a) not display or record any usable values, or

(b) identify the displayed or recorded representation with an error indication.

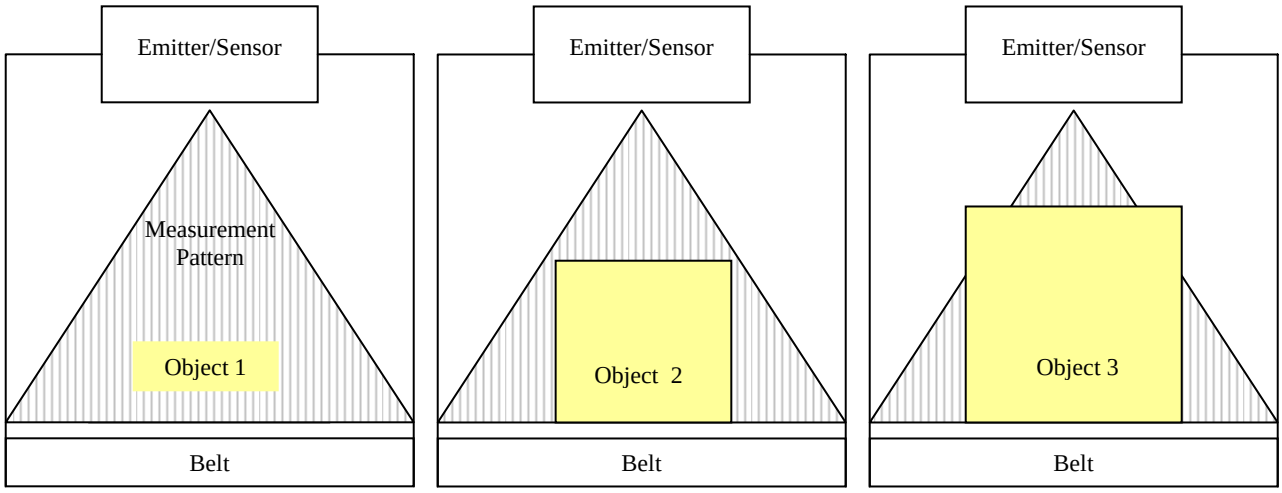
(Amended 2004)

Multiple Dimension Measuring Systems Table S.4.1.b. Notes for Table S.4.1.a.
. . .
7. Materials, shapes, structures, **combination of object dimensions,** or object orientations that are inappropriate for the device or those that are appropriate.
. . .

(Amended 2004)

Background/Discussion: This proposal was developed by the NIST Weights and Measures Division prior to MDMD Working Group's July 2003 Meeting, to address a request to clarify the requirements in Paragraph S.1.8 and the marking requirement in Note 7 in Table S.4.1.b. for limitation of use. Some device designs use a measurement pattern (as shown in example below) that may not allow the device to measure to both the marked maximum height limit and the marked maximum width limit on the same object. The marked maximum height and width are individually correct with respect to the device capability. The minimum and maximum dimension requirements in NIST Handbook 44 did not adequately address this scenario. Handbook 44 stated that if an object exceeded the marked measuring limitation for any axis by 105 % it must not display or record a value or it must provide an error message. In the example below, the shape, structure, or orientation of the largest object (object 3) in the example below does not exceed the manufacturers marked capacity for height or width individually; however, the system is not capable of providing an accurate measurement for this object because this combination of dimensions is beyond the device's capability. Note 7 in Table S.4.1.b., did not specifically address this situation.

Example:



Correct Measurement **Correct Measurement** **No Measurement**

At its July 2003 Meeting, the MDMD Working Group agreed that the current 105 % limit on overcapacity indication should be changed to the marked maximum plus 9 d for each dimension and/or total volume indicated. This change is consistent with Measurement Canada's requirements and other Handbook 44 Codes that have an overcapacity limit. The Working Group also agreed that the other proposed modifications to paragraph S.1.8. and Note 7 in Table S.4.1.a. are appropriate to recognize new measurement technologies that have been developed since the Tentative Code was adopted. The Work Group agreed to forward the proposals shown above to the S&T Committee for consideration. NCWM adoption of this item would aid in the effort to change the status of the Multiple Dimension Measuring Devices Code from "tentative" to "permanent."

At their Fall 2003 Meetings, the Western and Southern Weights and Measures Associations agreed with the proposal as written. In addition, the Western commended the MDMD Working Group for its work on this issue.

At the 2004 NCWM Interim Meeting, the Committee heard support for all items relating to the MDMD Code. The Committee also heard a suggestion to move a proposal to change the status of the code from "tentative" to "permanent" to the end of the 358 items. This change the in order of the items would insure that the status of the code would be decided after all other proposed changes to the code had been considered. The Committee agreed and reordered the items accordingly and proposed the items for a vote.

At their May 2004, meetings the CWMA & NEWMA supported this item 358-2 as presented.

At the 2004 NCWM Annual Meeting, a manufacturer of multiple dimension measuring devices indicated support for agenda items 358-1 through 358-7, noting that the proposals represented sound technical requirements developed by the work group with representation from manufacturers, users, and weights and measures officials.

358-3 VC S.3. Systems with Two or More Measuring Elements and Definition of Measurement Field

(This item was adopted.)

Source: Multiple Dimension Measuring Devices Working Group

Recommendation: Modify Handbook 44 5.58. Multiple Dimension Measuring Devices, paragraph S.3. as follows, and add a definition for the term "Measurement Field."

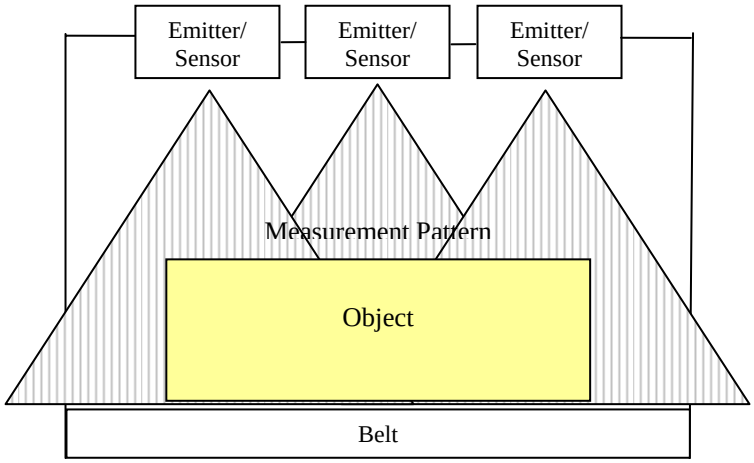
S.3. System with Two or More Measuring Elements. - A multiple dimension measuring system with a single indicating or recording element, or a combination indicating-recording element, that is coupled to two or more measuring elements with independent measuring systems, shall be provided with a means to prohibit the

activation of any measuring element (or elements) not in use, and shall be provided with automatic means to indicate clearly and definitely which measuring element is in use.

Note: This requirement does not apply to individual devices that use multiple emitters/sensors within a device in combination to measure objects in the same measurement field.

measurement field. – A region of space or the measurement pattern produced by the measuring instrument in which objects are placed or passed through, either singly or in groups, when being measured by a single device. [5.58.]
(Amended 2004)

Example:



Background/Discussion: This proposal was developed by the NIST Weights and Measures Division prior to MDMD Working Group's July 2003 Meeting to clarify the requirements in paragraph S.3. The original intent of this paragraph was to address more than one measuring element in separate locations within a single facility that are all coupled to a single indicator. For example, in a shipping hub there may be multiple lines each measuring different objects to increase the shipping capacity of the facility. All the measuring lines may be connected to a single indicator. At least one manufacturer believes that some interpret the term "measuring element" as applying to a device with multiple measuring elements (emitters/sensors) as shown in the example above. A problem arises with the existing language if a relatively narrow box is placed on the belt such that only one or two of the measuring elements shown makes measurements. The manufacturer is concerned that some may interpret paragraph S.3. to require the device in the example to identify the measuring element or elements involved in the measurement of a single object. The recommended changes should clarify the intent and application of this section. The Working Group supported the proposal as developed by WMD. NCWM adoption of this proposal would aid in the effort to change the status of the Multiple Dimension Measuring Devices Code from "tentative" to "permanent."

At its September 2003 Meeting, the Western Weights and Measures Association (WWMA) heard comments from a manufacturer supporting the proposal. The WWMA recommended alternate language for the proposed note to paragraph S.3. to clarify the intent of the proposal and editorial corrections to the language in the definition of "measurement field."

At its October 2003 Meeting, the Southern Weights and Measures Association (SWMA) supported the proposal as submitted by the MDMD Working Group. The SWMA was not necessarily opposed to the language submitted by WWMA, but it did not think the language was significantly different.

At the 2004 NCWM Interim Meeting, the Committee heard support for all items relating to the MDMD Code. The Committee also heard a suggestion to move a proposal to change the status of the code from "tentative" to "permanent" to the end of the 358 items. This change in the order of the items would insure that the status of the code would be decided after all other proposed changes to the code had been considered. Measurement Canada

indicated that the "note" in the original proposal and the WWMA alternate definition for "measurement field" were the most technically correct of the alternate language options proposed. Measurement Canada also recommended that the term "measuring element" in the example drawing be replaced with the term "emitter/sensor." The Committee agreed with Measurement Canada's recommendation and amended the proposal as presented above. The Committee agreed and reordered the items accordingly and proposed the item for a vote.

At their May 2004, meetings the CWMA & NEWMA supported this item as presented.

At the 2004 NCWM Annual Meeting, a manufacturer of multiple dimension measuring devices indicated support for agenda items 358-1 through 358-7, noting that the proposals represented sound technical requirements developed by the work group with representation from manufacturers, users, and weights and measures officials.

358-4 VC N.1.4.1. Test Objects and Definition of Test Objects

(This item was adopted.)

Source: Multiple Dimension Measuring Devices Working Group

Recommendation: Modify Handbook 44 Section 5.58. Multiple Dimension Measuring Devices, by adding a new paragraph N.1.4.1. Test Objects and a new definition of the term "test object" as follows:

N.1.4.1 Test Object. - Verification of devices may be conducted using appropriate test objects of various sizes and of stable dimensions. Test object dimensions must be known to an expanded uncertainty (coverage factor k = 2) of not more than one-third of the applicable device tolerance. The dimensions shall also be checked to the same uncertainty when used at the extreme values of the influence factors.

The dimensions of all test objects shall be verified using a reference standard that is traceable to NIST (or equivalent national laboratory) and meet the tolerances expressed in NIST Handbook 44 Fundamental Considerations, paragraph 3.2. (i.e., one-third of the smallest tolerance applied to the device).
(Added 2004)

test object. - An object whose dimensions are verified by appropriate reference standards and intended to verify compliance of the device under test with certain metrological requirements. [5.58]
(Added 2004)

Background/Discussion: This proposal originated from the July 2003 MDMD Working Group Meeting. Test standards similar to those developed by Canada for type approval are not currently available in the United States. Without available standards or standards specifications, it is difficult to ensure consistent test results from field inspections. Some state and local inspectors have conducted tests of multiple dimension measuring devices using packages that were available at the test site. If field officials choose to use on-site packages, great care must be taken in the selection of objects that are in a very stable condition and can be compared to a certified length standard with an appropriate degree of uncertainty. Cardboard boxes are particularly subject to damage and deformity. Due to the relative uncertainty of the measurement process, multiple dimension measuring devices with a division size of less than 1 cm (0.5 inch) should only be tested with verified test standards. Uncertainty can be stated as the range of values within which the true value to the "standard" is estimated to lie and defines the limits of error about a measured value between which the true value will lie with the confidence level stated. A coverage factor of k = 2 provides a confidence level of 95 %. The Multiple Dimension Measuring Devices Code provides guidance regarding the appropriate size of test objects, but it does not provide any other criteria for what constitutes an appropriate test object. The term "test object" is also not defined in Handbook 44. OIML R 129 Multi-dimensional measuring instruments, provides a definition for a test object and criteria for using test objects to verify the performance of multiple dimension measuring devices. Proposed paragraph N.1.4.1. provides field officials who do not have specifically designed standards for testing multiple dimension measuring devices with a mechanism for testing these devices, provided care is taken in developing proper reference standards. The approach can be compared to the testing of in-motion-monorail scales with carcasses. In both cases, care must be taken to verify that the standards are appropriate at the beginning of a test and remain stable throughout the entire test of the device. The Working Group agreed to submit the proposal as written to the NCWM S&T Committee for consideration at the

NCWM Interim Meeting. NCWM adoption of this item would aid in the effort to change the status of the Multiple Dimension Measuring Devices Code from "tentative" to "permanent."

At its September 2003 Meeting, the Western Weights and Measures Association (WWMA) heard comments from a manufacturer supporting the proposal. The WWMA S&T Committee was concerned about an apparent conflict between the language in the first proposed paragraph, which states that the expanded uncertainty of the test object must be known to one-fifth of the applicable device tolerance in field testing and to language in the second paragraph, which states that the test object be verified using standards with an uncertainty less than one-third of the smallest tolerance applied to the device. The WWMA recommended removing the expanded uncertainty language in the first paragraph of the original proposal since the language may be more appropriate for standards used for type evaluation tests.

At is October 2003 Meeting, the Southern Weights and Measures Association (SWMA) reviewed and supported the change to N.1.4.1 submitted by the WWMA.

After further review of the MDMD Working Group's proposal presented at the 2004 NCWM Interim Meeting, Measurement Canada submitted alternate language to simplify paragraph N.1.4.1. as shown above.

At the 2004 NCWM Interim Meeting, the Committee heard support for all items relating to the MDMD Code. The Committee also heard a suggestion to move a proposal to change the status of the code from "tentative" to "permanent" to the end of the 358 items. This change in the order of the items would insure that the status of the code would be decided after all other proposed changes to the code had been considered. The Committee agreed and reordered the items accordingly and proposed the items for a vote.

At their May 2004, meetings the CWMA & NEWMA supported this item as presented.

At the 2004 NCWM Annual Meeting, a manufacturer of multiple dimension measuring devices indicated support for agenda items 358-1 through 358-7, noting that the proposals represented sound technical requirements developed by the work group with representation from manufacturers, users, and weights and measures officials.

358-5 VC T.3. Tolerance Values

(This item was adopted.)

Source: Multiple Dimension Measuring Devices (MDMD) Working Group
Recommendation: Modify Handbook 44 Section 5.58. Multiple Dimension Measuring Devices, paragraph T.3. Tolerance Values as follows:

T.3. Tolerance Values. - The maintenance and acceptance tolerance values shall be ±1 division. ~~**These tolerances apply regardless of the shape or material of the object being measured unless otherwise marked on the device.**~~
(Amended 2004)

Background/Discussion: This proposal originated from the July 2003 MDMD Working Group Meeting. One member of the group indicated that his company believes that paragraph T.3. should be clarified and that the entire second sentence in the paragraph is unnecessary and could be misleading. The present wording of this section seems to imply that multiple tolerances are permitted on a system if they are marked on the device. Tolerances applicable to devices performing similar or duplicative functions should be equivalent. The work group agreed to submit the proposal as written to the NCWM S&T Committee for consideration at the NCWM Interim Meeting. NCWM adoption of this item would aid in the effort to change the status of the Multiple Dimension Measuring Devices Code from "tentative" to "permanent."

At its September 2003 Meeting, the Western Weights and Measures Association (WWMA) heard comments from a manufacturer supporting the proposal. The WWMA supported the proposal as submitted and recommended that the NCWM S&T Committee move the proposal forward as a voting item.

At its October 2003 Meeting, the Southern Weights and Measures Association (SWMA) supported the proposal as written.

At the 2004 NCWM Interim Meeting, the Committee heard support for all items relating to the MDMD Code. The Committee also heard a suggestion to move a proposal to change the status of the code from "tentative" to "permanent" to the end of the 358 items. This change in the order of the items would insure that the status of the code would be decided after all other proposed changes to the code had been considered. The Committee agreed and reordered the items accordingly and proposed the items for a vote.

At their May 2004, meetings the CWMA & NEWMA supported this item as presented.

At the 2004 NCWM Annual Meeting, a manufacturer of multiple dimension measuring devices indicated support for agenda items 358-1 through 358-7, noting that the proposals represented sound technical requirements developed by the work group with representation from manufacturers, users, and weights and measures officials.

358-6 VC T.5.2. Power Supply Voltage, T.5.2.1. Alternating Current Power Supply, and T.5.2.2. Direct Current Power Supply

(This item was adopted.)

Source: Multiple Dimension Measuring Devices (MDMD)Working Group

Recommendation: Modify Handbook 44 Section 5.58. Multiple Dimension Measuring Devices, paragraph T.5.2. Power Supply Voltage, add new paragraphs T.5.2.1. Alternating Current Power Supply and T.5.2.2. Direct Current Power Supply, as follows and remove paragraph T.7. Electric Power Supply.

T.5.2. Power Supply Voltage. - ~~**Devices shall satisfy the applicable tolerances when subjected to power supply voltage variation of –15 % to +10 % of the voltage rating specified by the manufacturer.**~~

T.5.2.1. Alternating Current Power Supply. - Devices that operate using alternating current must perform within the conditions defined in paragraphs T.3. through T.6., inclusive, from – 15 % to +10 % of the marked nominal line voltage(s) at 60 Hz, or the voltage range marked by the manufacturer, at 60 Hz.
(Added 2004)

T.5.2.2. Direct Current Power Supply. - Devices that operate using direct current shall operate and perform within the applicable tolerance at any voltage level at which the device is capable of displaying metrological registrations.
(Added 2004)
(Amended 2004)

~~**T.7. Electric Power Supply. – Battery-operated instruments shall not indicate nor record values outside the applicable tolerance limits when battery power output is excessive or deficient.**~~
~~**(Added 1999)**~~

Background/Discussion: This proposal originated from the July 2003 MDMD Working Group Meeting. The requirements currently in paragraphs T.5.2. and T.7. do not clearly distinguish between alternating current and direct current power supplies. The language was also not consistent with similar requirements in other Handbook 44 Codes, such as paragraph T.N.8.3. Electric Power Supply in the Scales Code or paragraph T.N.7.3. Electric Power Supply in the Automatic Weighing Systems Code. All codes should be consistent and, where possible, should harmonize with international requirements. The Work Group agreed to submit the proposal as written to the NCWM S&T Committee for consideration at the NCWM Interim Meeting. NCWM adoption of this item would aid in the effort to change the status of the Multiple Dimension Measuring Devices Code from "tentative" to "permanent."

At its September 2003 Meeting, the Western Weights and Measures Association (WWMA) heard comments from a manufacturer supporting the proposal. The WWMA supported the proposal as submitted and recommended that the NCWM S&T Committee move the proposal forward as a voting item.

At its October 2003 Meeting, the Southern Weights and Measures Association (SWMA) supported the proposal as written.

At the 2004 NCWM Interim Meeting, the Committee heard support for all items relating to the MDMD Code. The Committee also heard a suggestion to move a proposal to change the status of the code from "tentative" to "permanent" to the end of the 358 items. This change in the order of the items would insure that the status of the code would be decided after all other proposed changes to the code had been considered. The Committee agreed and reordered the items accordingly and proposed the items for a vote.

At their May 2004, meetings the CWMA & NEWMA supported this item as presented.

At the 2004 NCWM Annual Meeting, a manufacturer of multiple dimension measuring devices indicated support for agenda items 358-1 through 358-7, noting that the proposals represented sound technical requirements developed by the work group with representation from manufacturers, users, and weights and measures officials.

358-7 VC Tentative Status of the Multiple Dimension Measuring Devices Code

(This item was adopted.)

Source: Carryover Item 358-1. (This item originated from the Southern Weights and Measures Association (SWMA) and first appeared on the Committee's 2002 agenda.)

Recommendation: Change the status of the Multiple Dimension Measuring Devices Code (MDMD) from tentative to permanent.

Discussion: In response to comments from weights and measures officials and industry representatives, the Multiple Dimension Measuring Devices Code was considered in 2002 for permanent status. The Committee heard that the code should be harmonized with the more stringent Canadian requirements. Industry representatives cautioned that other issues may exist because the code was developed prior to some of the latest electronic technology. Therefore, in July 2002 the proposal was changed from a voting item to an information item pending further review.

During the 2003 NCWM Interim Meeting, the Committee heard that Canada is considering a number of proposals to modify Canadian requirements for Multiple Dimension Measuring Devices (MDMD) devices. Consequently, in the interest of aligning U.S. and Canadian requirements, the Committee agreed that the proposal should remain an information item to allow time for review and comparison of U.S. and pending Canadian requirements.

The MDMD Working Group met July 17-18, 2003, to discuss outstanding issues in the MDMD Code. The Work Group submitted proposals (358-1 through 358-6 in this report) for changes to NIST Handbook 44 to the NCWM S&T Committee for consideration at the January 2004 NCWM Interim Meeting.

At the 2004 NCWM Interim Meeting, the Committee heard support for all items relating to the MDMD Code. The Committee also heard a suggestion to move a proposal to change the status of the code from "tentative" to "permanent" to the end of the 358 items. This change in the order of the items would insure that the status of the code would be decided after all other proposed changes to the code had been considered. The Committee agreed and reordered the items accordingly and proposed the items for a vote.

At their May 2004, meetings the CWMA & NEWMA supported this item as presented.

At the 2004 NCWM Annual Meeting, a manufacturer of multiple dimension measuring devices indicated support for agenda items 358-1 through 358-7, noting that the proposals represented sound technical requirements developed by the work group with representation from manufacturers, users, and weights and measures officials.

For background information, refer to the 2002 and 2003 S&T Final Report.

360 OTHER ITEMS

360-1 W Revise NIST Handbook 44

(This item was withdrawn.)

Source: Carryover Item 360-1 (This item originated from the Southern Weights and Measures Association (SWMA) and first appeared on the Committee's 1999 agenda.)

Discussion: Work on revising NIST Handbook 44 has not resumed since 2000 when there were unanticipated changes to key members on the Handbook 44 Working Group. The Committee continues in its support of the BOD's efforts to eventually revise Handbook 44 to create a more user-friendly document.

The Western Weights and Measures Association recommended that this item remain informational and encouraged the NCWM Board of Directors (BOD) to support the revision project.

The Committee acknowledged that there is a need to create a more user-friendly document for the field official. An inspector's field manual that provides the "basic" information necessary to perform both an initial and subsequent field tests was one suggested publication. However, there has not been any work to revise Handbook 44 for almost five years. Consequently, the Committee withdrew this item from its agenda with plans to revisit the issue whenever the BOD is able to resume its work plan and can provide resources for the project.

360-2 I International Organization of Legal Metrology (OIML) Report

The complete OIML Report is included as part Appendix B of the NCWM OIML Board of Director's 2004 Final Report.

Many issues before the OIML, the Asian-Pacific Legal Metrology Forum (APLMF), and other international groups are within the purview of the S&T Committee. Additional information on OIML activities is available on the OIML web site at http://www.oiml.org/.

For more information on specific device activities see the Weights and Measures Division staff listed in the table below:

NIST Weights and Measures Division Contact List				
Staff	**Telephone**	**Email**	**Device Type**	**Postal Mail or Fax**
Steven Cook (LMDG)	301-975-4003	steven.cook@nist.gov	Weighing Devices	NIST WMD 100 Bureau Dr MS 2600 Gaithersburg, MD 20899-2600 Fax: 301-926-0647
Richard Harshman (LMDG)	301-975-8107	richard.harshman@nist.gov	R 134 - Weighing Road Vehicles In-Motion R 60 - Load Cells	
Diane Lee (LMDG)	301-975-4405	diane.lee@nist.gov	R 59 Moisture Meters for Cereal Grains and Oilseeds	
Ralph Richter (ILMG)	301-975-4025	ralph.richter@nist.gov	R 117 - Measuring Systems for Liquids Other Than Water R 105 - Direct Mass Flow Measuring Systems for Quantities of Liquids, and Gas Meters	
Wayne Stiefel (ILMG)	301-975-4011	s.stiefel@nist.gov	Measuring Devices	
Ambler Thompson (ILMG)	301-975-2333	ambler@nist.gov	Electronic Measuring Devices	
Juana Williams (LMDG)	301-975-3989	juana.williams@nist.gov	R 21 Taximeters	
LMDG - Legal Metrology Devices Group ILMG - International Legal Metrology Group				

The Committee encourages the BOD to implement a plan to address U.S./OIML harmonization.

360-3 D Developing Issues

The NCWM established a mechanism to disseminate information about emerging issues which have merit and are of national interest. Developing issues have not received sufficient review by all parties affected by the proposal or may be insufficiently developed to warrant review by the NCWM S&T Committee. The developing issues listed below are currently under review by at least one regional association or technical committee.

The developing issues are listed in Appendix A according to the specific NIST Handbook 44 Code Section under which they fall.

The S&T Committee encourages interested parties to examine the proposals included in Appendix A and send their comments to the contact listed in each item.

The Committee asks that the regional weights and measures associations and National Type Evaluation Technical Committee Sectors continue their work to fully develop each proposal. Should an association or Sector decide to discontinue work on a developmental item, the Committee asks that it be notified.

360-4 I Add International Terms that are Synonyms to NIST Handbook 44 Terms to Appendix D; Definitions

Source: Northeastern Weights and Measures Association (NEWMA)

Discussion: Many Handbook 44 and OIML technical concepts and procedures are in harmony, yet, there are significant differences in the terminology used. The harmonization of language is not necessary to harmonize requirements provided a state of equivalence exists; however, improvements should be promoted where the

language is confusing or has the potential for misinterpretation. Currently, the U.S. National Working Group (USNWG) on R 76 Non-Automatic Weighing Instruments is working on a proposal to amend NIST Handbook 44 Appendix D, Definitions to include international terminology that is synonymous with Handbook 44 definitions. The USNWG will identify Handbook 44 terms or definitions that are equivalent to international vocabulary in a format that is similar to the example shown below:

> **automatic zero-setting mechanism (OIML R 76: zero-tracking device).** Automatic means provided to maintain zero . . . operation. [2.20]

The work to amend Appendix D will also clarify terminology for international participants in the proposed Mutual Acceptance Arrangement (MAA)(see BOD Agenda, Appendix A for more information), where it is imperative that all affected parties are aware and understand each other's requirements. For example, the Handbook 44 term "automatic zero setting" has an entirely different meaning in R 76. Handbook 44 is also inconsistent in the use of many terms such as "division," "increment," and "interval." The addition of international terminology to existing Handbook 44 language may also help to eliminate any confusion about the use of other frequently used terms such as: device, element, mechanism, scale, weigher, and balance.

A subcommittee made up of USNWG members has volunteered to review and suggest recommendations on Handbook 44 General Code and Scales Code definitions where there is equivalent international terminology. The group plans to ballot the USNWG and submit a completed proposal to the NCWM S&T Committee. This item is intended to familiarize the public and private sectors with the proposed approach to modify Appendix D.

NEWMA supports this item and views it as a first step toward educating weights and measures officials. Future steps should include making proposed changes to incorporate international terms in the text of Handbook 44 with the ultimate goal of having one mutually acceptable set of terms. The Committee concurred with NEWMA's assessment that the proposal is a necessary step to harmonize U.S. and international terminology to ultimately harmonize U.S. and International Standards. The Committee decided to make this an information item to allow the work group sufficient time to complete its work.

Chairman Jack Kane, Montana

Clark Cooney, Oregon
Carol P. Fulmer, South Carolina
Michael J. Sikula, New York

Ted Kingsbury, Canada, Technical Advisor
Richard Suiter, NIST, Technical Advisor
Juana Williams, NIST, Technical Advisor

Committee on Specifications and Tolerances

Appendix A

Item 360-3: Developing Issues

D Part 1, General Code;G-S.5.6.1. Recorded Representation of Metric Units on Equipment with Limited Character Sets

Source: Western Weights and Measures Association (WWMA)

Recommendation: Modify paragraph G-S.5.6.1. as follows:

G-S.5.6.1. ~~Recorded Representation of Metric Units on Equipment with Limited Character Sets~~ Acceptable Abbreviations for Recorded and Indicated Representation of Units on Equipment. - The appropriate defining symbols are shown in Table 1.

Add the following new abbreviations to existing Table 1 Representation of Units in the General Code:

Name of Unit	Common Use Symbol	Representation			Name of Unit	Common Use Symbol	Representation		
		Form I	Form II				Form I	Form II	
		(double case)	(single lower case)	(single case upper)			(double case)	(single lower case)	(single case upper)
inch	in	in	in	IN	deciliter	dL	dL		
foot	ft	ft	ft	FT	kiloliter	kL	kL		
yard	yd	yd	yd	YD	cubic meter	M^3	m^3	m^3	M^3
milligram	mg	mg	mg		cubic inch	in^3	in^3	in^3	IN^3
megagram	Mg	Mg			cubic foot	ft^3	ft^3	ft^3	FT^3
grain	gr	gr	gr		cubic yard	yd^3	yd^3	yd^3	YD^3
dram	dr	dr	dr		gills	gi	gi	Gi	GI
ounce	oz	oz	oz	OZ	pint	pt	pt	pt	PT
pound	lb	lb	lb	LB	quart	qt	qt	qt	QT
hundredweight	cwt	cwt	cwt	CWT	gallon	gal	gal	gal	GAL
pennyweight	dwt	dwt	dwt	DWT	ampere	A, I	A, I		A, I
ounce troy	oz t	oz t	oz t	OZ T	resistance	ohm	ohm	ohm	OHM
milliliter	mL	mL							
centiliter	cL	cL							

Discussion: The WWMA notes that the current Table 1 does not include many units that are in common use today.

To provide input on this proposal contact Gary Castro, California Division of Measurement Standards by telephone at 916-229-3018, by fax at 916-229-3015, or by e-mail at gcastro@cdfa.ca.gov.

D Part 2, Scales; Table 4. Minimum Test Weights and Test Loads; Device Capacity 500 000 lb

Source: Northeastern Weights and Measures Association (NEWMA)

Recommendation: Modify Table 4. Minimum Test Weights and Test Loads as follows:

Table 4.
Minimum Test Weights and Test Loads[1]

Device capacity	Minimums (in terms of device capacity)		(where practicable)
	Test weights (greater of)	Test loads[2]	
0 to 150 kg (0 to 300 lb)	100 %		
151 to 1 500 kg (301 to 3 000 lb)	25 % or 150 kg (300 lb)	75 %	Test weights to dial face capacity, 1 000 d, or test load to used capacity, if greater than minimums specified
1 501 to 20 000 kg (3 001 to 40 000 lb)	12.5 % or 500 kg (1 000 lb)	50 %	
20 001 kg~~+~~ **to 250 000 kg** (40 001 lb~~+~~ **to 500 000 lb**)	**12.5 % or 5 000 kg (10 000 lb)**	25 %[3]	During initial verification, a scale should be tested to capacity.

[1] If the amount of test weight in Table 4 combined with the load on the scale would result in an unsafe condition, then the appropriate load will be determined by the official with statutory authority.

[2] The term "test load" means the sum of the combination of field standard test weights and any other applied load used in the conduct of a test using substitution test methods. Not more than three substitutions shall be used during substitution testing, after which the tolerances for strain load tests shall be applied to each set of test loads.

[3] The scale shall be tested from zero to at least 12.5 % of scale capacity using known test weights, and then to at least 25 % of scale capacity using either a substitution or strain load test that utilizes known test weights of at least 12.5 % of scale capacity. Whenever practical, a strain load test should be conducted to the used capacity of the scale. When a strain load test is conducted, the tolerances apply only to the test weights or substitution test loads.
(Amended 1988, 1989, 1994, and 2003)

Discussion: The Committee acknowledged that the NEWMA proposal to modify Table 4, Minimum Test Weights and Test Loads begins to address the minimum test load required for all large capacity scales. However, the proposal erroneously appeared in 2004 S&T Interim Agenda Item 320-2 when it is a separate issue that has merit, but is insufficiently developed for Committee action. Consequently, NEWMA's proposal now appears as a developing item in Appendix A Part 2, Scales Code as shown in the recommendation above.

NEWMA submitted the proposal because jurisdictions encounter scales with 1 000 000 lb nominal capacity and must determine the minimum test load. NEWMA finds that NIST Handbook 44 is flexible, but does not provide any definitive guidelines on test loads for large capacity scales. NEWMA recognized the problems jurisdictions face when testing scales with very large capacities; therefore, it submitted a proposal to modify Table 4. NEWMA modified its proposal by reducing the maximum scale capacity from 1 000 000 lb to 500 000 lb. NEWMA also removed from the proposal a new footnote that permitted the official with statutory authority to determine the minimum test load for scales that exceeded 500 000 lb nominal capacity. NEWMA believes the proposal is very relevant, but is not ready for adoption, until it receives thorough discussion at the regional level.

The Scale Manufacturers Association reviewed the proposal, but did not take a position on the modifications to Table 4.

The Committee agreed that Table 4 is the appropriate place in Handbook 44 to provide some guidance on the appropriate minimum test load for subsequent tests on scales that exceed capacities of 400 000 lb. The Committee believes that the issue warrants a high priority, but requires further review and input from both the public and private sectors.

To provide input on this proposal contact Michael Sikula, New York Bureau of Weights and Measures, by telephone at 518-457-3452, by fax at 518-457-2552, or by e-mail at mike.sikula@agmkt.state.ny.us.

Appendix B

Item 324-1: Tentative Status of the Automatic Weighing Systems Code

Section 2.24. Automatic Weighing Systems ~~– Tentative Code~~

~~**This tentative code has only a trial or experimental status and is not intended to be enforced by weights and measures officials. The requirements are designed for study prior to the development and adoption of a final Code for Automatic Weighing Systems. The tentative code is intended to be used by the National Type Evaluation Program for type evaluation of automatic weighing systems. If upgraded to become a permanent code, all requirements, except those for tolerances, will be nonretroactive as of the effective date of the permanent code; tolerance requirements will apply retroactively as of the effective date of the permanent code.**~~

~~**(Tentative Code Added 1995) (Amended 1998)**~~

The status of Section 2.24. Automatic Weighing Systems was changed from tentative to permanent in July 2004 and will go into effect on January 1, 2005.

NTEP has been evaluating devices under the provisions of this code since it was added to Handbook 44 in 1995. In addition, a number of weights and measures jurisdictions as well as organizations such as USDA have implemented this code using the provisions of General Code Paragraph G-A.3. - Special and Unclassified Equipment. It is recommended that the jurisdictions who have not implemented this code, work with industry to expedite implementation of its use.

A. Application

A.1. - This code applies to devices used to **automatically** weigh **pre-assembled discrete loads or single loads of loose materials in applications where automatic weighing systems[1] are used or employed in the determination of quantities, things, produce, or articles for distribution, purchase, offered or submitted for sale, or in computing any basic charge or payment for services rendered on the basis of weight, and in packaging plants subject to regulation by the United States Department of Agriculture (USDA).** ~~**or fill packages while the object is in motion**~~ Some weigh-labelers **and check-weighers** may also include a scale that is incorporated in a conveyor system that weighs packages in a static **or non-automatic** weighing mode[2].

This includes:

(a) **Automatic** ~~**W**~~**w**eigh-labelers~~**, static and dynamic**~~

(b) Combination automatic and non-automatic weigh-lablers

(c) Automatic checkweighers

---

[1] **An automatic weighing system does not require the intervention of an operator during the weighing process. The necessity to give instructions to start a process or to release a load, or the function of the instrument (static, dynamic, set-up, etc.) are not relevant in deciding the category of automatic or non-automatic instruments.**

[2] **Prepackaging scales (and other commercial devices) used for putting up packages in advance of sale are acceptable for use in commerce if all appropriate provisions of Handbook 44 are met. Users of such devices must be alert to the legal requirements relating to the declaration of quantity on a package. Such requirements are to the effect that, on the average, the contents of the individual packages of a particular commodity comprising a lot, shipment, or delivery must contain at least the quantity declared on the label. The fact that a scale or other commercial device may overregister, but within established tolerances, and is approved for commercial service is not a legal justification for packages to contain, on the average, less than the labeled quantity.**

~~**(Amended 1997)**~~

(d) Combination automatic and non-automatic checkweighers

(e) **Automatic gravimetric filling machines that weigh discrete loads or single loads of loose materials and determine package and production lot compliance with net weight representations**.

(Amended 1997 **and 2004**)

A.2. - This code does not apply to:

(a) Belt-Conveyor Scale Systems

(b) Railway Track Scales

(c) Monorail Scales

(d) Automatic Bulk-Weighing Systems

(e) Devices that measure quantity on a time basis

(f) Controllers or other auxiliary devices except as they may affect the weighing performance

(g) Automatic gravimetric filling machines and other automatic weighing systems employed in determining the weight of a commodity in a plant or business with a quantity control program (e.g., a system of statistical process control) using suitable weighing instruments and measurement standards traceable to national standards to determine production lot compliance with net weight representations[3].
(Added 2004)

A.3. - Also see General Code requirements.

~~**A.4. Type Evaluation. - The National Type Evaluation Program will accept for type evaluation only those devices that comply with all requirements of this code.**~~
~~**(Added 1998)**~~

S. Specifications

S.1. Design of Indicating and Recording Elements and of Recorded Representations.

S.1.1. Zero Indication.

(a) A weigh-labeler shall be equipped with an indicating or recording element. ~~**It**~~ **Additionally, a weigh-labeler equipped with an indicating or recording element** shall either indicate or record a zero-balance condition and an out-of-balance condition on both sides of zero.
(Amended 2004)

(b) An automatic checkweigher may be equipped with an indicating or recording element.

(c) A zero-balance condition may be indicated by other than a continuous digital zero indication, provided that effective automatic means is provided to inhibit a weighing operation or to return to a continuous digital indication when the device is in an out-of-balance condition.

[3] **See NIST Handbook 130, Uniform Laws and Regulations In the Area of Legal Metrology and Engine Fuel Quality, Interpretations and Guidelines paragraph 2.6.11. Good Quantity Control Practices.**

S.1.1.1. Digital Indicating Elements.

(a) A digital zero indication shall represent a balance condition that is within ± ½ scale division.

(b) A digital indicating device shall either automatically maintain a "center of zero" condition to ± ¼ scale division or less, or have an auxiliary or supplemental "center-of-zero" indicator that defines a zero-balance condition to ± ¼ scale division or less.

(c) Verification of the accuracy of the center of zero indication to ± ¼ scale division or less during ~~**dynamic**~~ **automatic** operation is not required on automatic checkweighers. **(Amended 2004)**

S.1.2. Value of Division Units. - The value of a division "d" expressed in a unit of weight shall be equal to:

(a) 1, 2, or 5; or

(b) a decimal multiple or submultiple of 1, 2, or 5.

S.1.2.1. Weight Units. – **Except for postal scales, indicating and recording elements for shipping and postal applications, and scales used to print standard pack labels, ~~A~~** a device shall indicate weight values using only a single unit of measure. **(Amended 2004)**

S.1.3. Provision for Sealing.

(a) **Automatic Weighing Systems, Except Automatic Checkweighers. -** A device shall be designed with provision(s) as specified in Table S.1.3., "Categories of Device and Methods of Sealing," for applying a security seal that must be broken, or for using other approved means of providing security (e.g., data change audit trail available at the time of inspection), before any change that detrimentally affects the metrological integrity of the device can be made to any electronic mechanism.

(b) **For Automatic Checkweighers. -** Security seals are not required in ~~**field**~~ applications where it would prohibit an authorized user from having access to the calibration functions of a device.

Table S.1.3.
Categories of Device and Methods of Sealing

Categories of Device	Method of Sealing
Category 1: No Remote configuration capability.	Seal by physical seal or two event counters: one for calibration parameters and one for configuration parameters.
Category 2: Remote configuration capability, but access is controlled by physical hardware. The device shall clearly indicate that it is in the remote configuration mode and record such message if capable of printing in this mode.	The hardware enabling access for remote communication must be at the device and sealed using a physical seal or two event counters: one for calibration parameters and one for configuration parameters.
Category 3: Remote configuration capability access may be unlimited or controlled through a software switch (e.g., password).	An event logger is required in the device; it must include an event counter (000 to 999), the parameter ID, the date and time of the change, and the new value of the parameter. A printed copy of the information must be available through the device or through another on-site device. The event logger shall have a capacity to retain records equal to ten times the number of sealable parameters in the device, but not more than 1000 records are required. (Note: Does not require 1000 changes to be stored for each parameter.)

S.1.4. Automatic Calibration. - A device may be fitted with an automatic or a semi-automatic calibration mechanism. This mechanism shall be incorporated inside the device. After sealing, neither the mechanism nor the calibration process shall facilitate fraud.

S.1.5. Adjustable Components. - Adjustable components shall be held securely in adjustment and, except for a zero-load balance mechanism, shall be located within the housing of the element.

S.2. Design of Zero and Tare Mechanisms.

S.2.1. Zero Load Adjustment.

S.2.1.1. Automatic Zero-Setting Mechanism (Zero-tracking). - Except for automatic checkweighers, under normal operating conditions the maximum load that can be "rezeroed," when either placed on or removed from the platform all at once, shall be 1.0 scale division.
(Amended 2004)

S.2.1.2. Initial Zero-Setting Mechanism. - Except for automatic checkweighers, an initial zero-setting mechanism shall not zero a load in excess of 20 % of the maximum capacity of the automatic weighing system unless tests show that the scale meets all applicable tolerances for any amount of initial load compensated by this device within the specified range.

S.2.2. Tare. - On any automatic weighing system the value of the tare division shall be equal to the value of the scale division. The tare mechanism shall operate only in a backward direction (i.e., in a direction of underregistration) with respect to the zero-load balance condition of the automatic weighing system. A device designed to automatically clear any tare value shall also be designed to prevent the automatic clearing of tare until a complete transaction has been indicated.

Note: On a computing automatic weighing system, this requires the input of a unit price, the display of the unit price, and a computed positive total price at a readable equilibrium. Other devices require a ~~**complete . weighing operation, including tare, net, and gross weight determination**~~ **transaction or lot run ~~has been~~ be completed**
(Amended 2004)

S.3.1. Multiple Range and Multi-Interval Automatic Weighing System. The value of "e" shall be equal to the value of "d."

S.3.2. Load Cell Verification Interval Value. - The relationship of the value for the load cell verification scale interval, v_{min}, to the scale division "d" for a specific scale installation shall be:

$$v_{min} \leq \frac{d}{\sqrt{N}}$$, where N is the number of load cells in the scale.

Note: When the value of the scale division "d" differs from the verification scale division "e" for the scale, the value of "e" must be used in the formula above.

S.3.3. - For automatic checkweighers, the value of "e" shall be specified by the manufacturer and may be larger than "d," but in no case can "e" be more than 10 times the value of "d."

S.4. Weight Indicators, Weight Displays, Reports, and Labels.

~~**S.4.1. Weight Units. - An indicating or recording element shall indicate weight values using only a single unit of measure.**~~

S.4.~~2~~1. Additional Digits in Displays. - Auxiliary digital displays that provide additional digits for use during performance evaluation may be included on automatic checkweighers. However, in cases where these indications are not valid for determining the actual weight of a package (e.g., only appropriate for use in

statistical process control programs by users) they shall be clearly and distinctly differentiated from valid weight displays by indicating them to the user.

For example, the additional digits may be differentiated by color, partially covered by placing crosshatch overlays on the display, or made visible only after the operator presses a button or turns a key to set the device in a mode which enables the additional digits.

S.4.~~3~~2. Damping. - An indicating element equipped with other than automatic recording elements shall be equipped with effective means to permit the recording of weight values only when the indication is stable within plus or minus one scale division. The values recorded shall be within applicable tolerances.

S.4.43. Over Capacity Indication. - An indicating or recording element shall not display nor record any values when the scale capacity is exceeded by nine scale divisions.

S.4.~~5~~4. Label Printer. - A device that produces a printed ticket to be used as the label for a package shall print all values digitally and of such size, style of type, and color as to be clear and conspicuous on the label.

S.4.~~5~~.41. Label Printing. - If an automatic checkweigher prints a label containing weight information that will be used in a commercial transaction, it must conform to all of the requirements specified for weigh-labelers so that the printed ticket meets appropriate requirements.

S.5. Accuracy Class.

S.5.1. Marking. - Weigh-labelers and automatic checkweighers shall be Class III devices and shall be marked accordingly, except that a weigh-labeler marked Class IIIS may be used in package shipping applications. (Amended 1997)

S.6. Parameters for Accuracy Classes. - The number of divisions for device capacity is designated by the manufacturer and shall comply with parameters shown in Table S.6.

Table S.6.
Parameters for Accuracy Classes

		Number of divisions (n)	
Class	**Value of the verification division (~~d or~~ e)**	**Minimum**	**Maximum**
SI Units			
III	0.1 to 2g inclusive	100	10 000
	equal to or greater than 5g	500	10 000
INCH-POUND Units			
III	0.0002 lb to 0.005 lb, inclusive	100	10 000
	0.005 oz to 0.125 oz, inclusive	100	10 000
	equal to or greater than 0.01 lb	500	10 000
	equal to or greater than 0.25 oz	500	10 000
IIIS	greater than 0.01 lb	100	1000
	greater than 0.25 oz	100	1000

For Class III devices, the value of "e" is specified by the manufacturer as marked on the device; "d" shall not be smaller than 0.1 "e." "e" shall be differentiated from "d" by size, shape, or color.
(Amended 2004)

S.7. Marking Requirements. [See also G-S.1., G-S.4., G-S.6., G-S.7., G-U.2.1.1., and UR.3.3.]

S.7.1. Location of Marking Information. - Automatic weighing systems which are not permanently attached to an indicating element, and for which the load-receiving element is the only part of the weighing/load-receiving element visible after installation, may have the marking information required in G-S.1. of the General Code and Table S.7.a. and S.7.b. of the Automatic Weighing Systems Code located in an area that is accessible only through the use of a tool; provided that the information is easily accessible (e.g., the information may appear on the junction box under an access plate). The identification information for these automatic weighing systems shall be located on the weighbridge (load-receiving element) near the point where the signal leaves the weighing element or beneath the nearest access cover.

S.7.2. Marking Required on Components of Automatic Weighing Systems. - The following components of automatic weighing systems shall be marked as specified in Tables S.7.a. and S.7.b.:

(a) Main elements and components when not contained in a single enclosure for the entire automatic weighing system;

(b) Load cells for which Certificates of Conformance (CC) have been issued under the National Type Evaluation Program; and

(c) Other equipment necessary to a weighing system but having no metrological effect on the weighing system.

Table S.7.a. Marking Requirements

To Be Marked With ⇓	**Weighing Equipment**				
	Weighing, load-receiving, and indicating element in same housing	**Indicating element not permanently attached to weighing and load-receiving element**	**Weighing and load-receiving element not permanently attached to indicating element**	**Load cell with CC (10)**	**Other equipment or device (9)**
Manufacturer's ID (1)	x	x	x	x	x
Model Designation (1)	x	x	x	x	x
Serial Number and Prefix (2)	x	x	x	x	x (13)
Certificate of Conformance Number (16)	x	x	x	x	x (16)
Accuracy Class (14)	x	x (8)	x	x	
Nominal Capacity (3)(15)	x	x	x		
Value of Division, d (3)	x	x			
Value of "e" (4)	x	x			
Temperature Limits (5)	x	x	x	x	
Special Application (11)	x	x	x		
Maximum Number of Scale Divisions, n_{max} (6)		x (8)	x	x	
Minimum Verification Division, (e_{min})			x		
"S" or "M" (7)				x	
Direction of Loading (12)				x	
Minimum Dead Load				x	
Maximum Capacity (Max)	x			x	
Minimum Capacity (Min)	x				

Table S.7.a. Marking Requirements					
To Be Marked With ⇓	**Weighing Equipment**				
	Weighing, load-receiving, and indicating element in same housing	**Indicating element not permanently attached to weighing and load-receiving element**	**Weighing and load-receiving element not permanently attached to indicating element**	**Load cell with CC (10)**	**Other equipment or device (9)**
Safe Load Limit				x	
Load Cell Verification Interval (v_{min})				x	
Maximum Belt Speed (m/sec or m/min)	x		x		

Note: See Table S.7.b. for applicable parenthetical notes.
(Amended 1999)

Table S.7.b.
Notes for Table S.7.a.

1. Manufacturer's identification and model designation. (See G-S.1.)

2. Serial number and prefix. (See G-S.1.)

3. The nominal capacity and value of the automatic weighing system division shall be shown together (e.g., 50 000 x 5 kg, or 30 x 0.01 lb) adjacent to the weight display when the nominal capacity and value of the automatic weighing system division are not immediately apparent. Each division value or weight unit shall be marked on variable-division value or division-unit automatic weighing systems.

4. Required only if different from "d."

5. Required only on automatic weighing systems if the range is other than -10 °C to 40 °C (14 °F to 104 °F).

6. This value may be stated on load cells in units of 1000; (e.g., n: 10 is 10 000 divisions.)

7. Denotes compliance for single or multiple load cell applications.

8. An indicating element not permanently attached to a weighing element shall be clearly and permanently marked with the accuracy Class III, or IIIS and the maximum number of divisions, n_{max}.

9. Necessary to the weighing system but having no metrological effect, e.g., auxiliary remote display, keyboard, etc.

10. The markings may be either on the load cell or in an accompanying document; except that, if an accompanying document is provided, the serial number shall appear both on the load cell and in the document. The manufacturer's name or trademark, the model designation, and identifying symbol for the serial number shall also be marked both on the load cell and in any accompanying document.

11. An automatic weighing system designed for a special application rather than general use shall be conspicuously marked with suitable words visible to the operator and customer restricting its use to that application.

12. Required if the direction of loading the load cell is not obvious.

13. Serial number and prefix (See G-S.1) Modules without “intelligence” on a modular system (e.g., printer, keyboard module, cash drawer, and secondary display in a point-of-sale system) are not required to have serial numbers.

14. The accuracy Class of a device shall be marked on the device with the appropriate designation.

Table S.7.b. Notes for Table S.7.a.
15. The nominal capacity shall be conspicuously marked on any automatic-indicating or recording automatic weighing system so constructed that the capacity of the indicating or recording element, or elements, is not immediately apparent.
16. Required only if a CC has been issued for the equipment.

N. Notes

N.1. Test Requirements for Automatic Weighing Systems.

N.1.1. Test Pucks and Packages.

(a) Test pucks and packages shall be:

(i) representative of the type, size, and weight ranges to be weighed on a device, and

(ii) stable while in motion, hence the length and width of a puck or package should be greater than its height.

(b) For type evaluation the manufacturer shall supply the test pucks or packages for each range of test loads.

(Amended 1997)

N.1.2. Accuracy of Test Pucks or Packages. - The error in any test puck or package shall not exceed one-fourth (1/4) of the acceptance tolerance. If packages are used to conduct field tests on automatic weighing systems, the package weights shall be determined on a reference scale or balance with an inaccuracy that does not exceed one-fifth (1/5) of the smallest tolerance that can be applied to the device under test.

N.1.3. Verification (Testing) Standards. - Field standard weights shall comply with requirements of NIST Handbook 105-1 (Class F) or the tolerances expressed in Fundamental Considerations, paragraph 3.2. (i.e., one-third of the smallest tolerance applied).

N.1.4. Radio Frequency Interference (RFI) and Other Electromagnetic Interference Susceptibility, Field Evaluation. - An RFI test shall be conducted at a given installation when the presence of RFI has been verified and characterized if those conditions are considered "usual and customary."
(Added 2004)

~~**N.2. Test Requirements for Automatic Weighing Systems.**~~

N. ~~2.~~1.5. Tests Loads. - A performance test shall consist of four separate test runs conducted at different test loads according to Table N**. ~~3.2~~1.5.**

Table N. ~~3.2~~1.5. Test Loads
At or near minimum capacity
At or near maximum capacity
At two (2) critical points between minimum and maximum capacity
Test may be conducted at other loads if the device is intended for use at other specific capacities

N. ~~2.2~~1.6. Influence Factor Testing. - Influence factor testing shall be conducted statically.

N.~~3~~2. Test Procedures - Weigh-Labelers. - If the device is designed for use in **~~static~~ a non-automatic** weighing **mode,** it shall be tested **~~statically using mass standards~~ in the non-automatic mode according to Handbook 44 Section 2.20 Scales Code.**

Note: If the device is designed for only ~~**dynamic**~~ **automatic** weighing, it shall only be tested ~~**dynamically**~~ **in the automatic mode.**
(Amended 2004)

N.~~3~~2.1. ~~Laboratory Static~~ Non-automatic Tests.

N.~~3~~2.1.1. Increasing-Load Test. - The increasing-load test shall be conducted with the test loads approximately centered on the load-receiving element of the scale.

N.~~3~~2.1.2. Decreasing-Load Test. - The decreasing-load test shall be conducted with the test loads approximately centered on the load-receiving element of the scale.

N.~~3~~2.1.3. Shift Test. - To determine the effect of off-center loading, a test load equal to one-half (½) maximum capacity shall be placed in the center of each of the four points equidistant between the center and front, left, back, and right edges of the load receiver.

N.~~3~~2.1.4. Discrimination Test. - A discrimination test shall be conducted with the weighing device in equilibrium at zero load and at maximum test load, and under controlled conditions in which environmental factors are reduced to the extent that they will not affect the results obtained. This test is conducted from just below the lower edge of the zone of uncertainty for increasing load tests, or from just above the upper edge of the zone of uncertainty for decreasing-load tests.

N.~~3~~2.1.5. Zero-Load Balance Change. - A zero-load balance change test shall be conducted on all automatic weighing systems after the removal of any test load. The zero-load balance should not change by more than the minimum tolerance applicable. (Also see G-UR.4.2.)

~~**N.3.1.6. Influence Factor Testing. - Influence factor testing shall be conducted.**~~
(Amended 2004)

~~**N.3.2. Laboratory - Dynamic Tests. - The device shall be tested at the highest speed for each weight range using standardized test pucks or packages. Test runs shall be conducted using four test loads as described in Table N.3.2. Each test load shall be run a minimum of 10 consecutive times.**~~

~~**N.3.2.1. Shift Test. - To determine the effect of eccentric loading, for devices without a means to align packages, a test load equal to one-third (1/3) maximum capacity shall be passed over the load receiver or transport belt (1) halfway between the center and front edge, and (2) halfway between the center and back edge.**~~

N.~~3.3~~2.2.~~.~~ ~~Field~~ Automatic Test Procedures.

N.~~3.3~~ 2.2.1. Tests Non-automatic ~~Static~~. - If the automatic weighing system is designed to operate **non-automatically~~statically~~,** and used in that manner, during normal use operation, it shall be tested **non-automatically~~statically~~** using mass standards. The device shall not be tested ~~**statically**~~ **non-automatically** if it is used only ~~**dynamically**~~**in the automatic mode.**

N.~~3.3~~2.2.2. ~~Dynamic~~Automatic Tests. - The device shall be tested at the normal operating speed using packages. Test runs should be conducted using at least two test loads distributed over its normal weighing range (e.g., ~~**at**~~ **near** the lowest and highest ranges in which the device is typically operated.) Each test load should be run a minimum of 10 consecutive times.
(Amended 2004)

N.~~4~~ 3. Test Procedures - Automatic Checkweigher.

N.~~4~~ 3.1. ~~Laboratory - Static~~ Tests Non-Automatic. - If the scale is designed to operate **non-~~statically~~ automatically** during normal user operation, it shall be tested ~~**statically**~~ **non-automatically according to**

paragraphs N.2.1.1. Increasing Load Tests through N.2.1.5. Zero-Balance Change ~~**using the applicable weigh-labeler requirements**~~**.**
(Amended 2004)

N.~~.4~~.3.2. ~~Laboratory - Dynamic~~ Automatic Tests. - The device shall be tested at the highest speed in each weight range using standardized test pucks or packages. Test runs shall be conducted using **two**~~**four**~~ test loads. The number of consecutive test weighments shall **one-half (1/2) of those specified** ~~**be as described**~~ in Table N.**3.**4.2. **but not less than 10.**
(Amended 2004)

Table N.~~.4~~.3.2. Number of Sample Weights per Test for Automatic Checkweighers	
Weighing Range **m = mass of test load**	**Number of sample weights per test**
20 divisions ≤ m ≤ 10 kg 20 divisions ≤ m ≤ 22 lb	60
10 kg <m ≤ 25 kg 22 lb <m ≤ 55 lb	32
25 kg <m ≤ 100 kg 55 lb <m ≤ 220 lb	20
100 kg (220 lb) < m	10

~~**N.4.3. Field Test Procedures.**~~

~~**N.4.3.1. Static Tests. - If the scale is designed to operate statically during normal user operation, it shall be tested statically according to Sections N.3.1.1. through N.3.1.5.**~~

~~**N.4.3.2. Dynamic Tests. - The device shall be tested dynamically at the highest normal operating speed using packages at two test loads distributed over its normal weighing range. The number of consecutive weighments shall be one-half (½) of those specified in Table N.4.2., but not less than 10.**~~

T. Tolerances

T.1. Principles.

T.1.1. Design. - The tolerance for a weighing device is a performance requirement independent of the design principle used.

T.1.2. Scale Division. - The tolerance for a weighing device is related to the value of the scale division (d) or the value of the verification scale division (e) and is generally expressed in terms of d or e. The random tolerance for automatic checkweighers is expressed in terms of Maximum Allowable Variance (MAV).

T.2. Tolerance Application.

T.2.1. General. - The tolerance values are positive (+) and negative (-) with the weighing device adjusted to zero at no load. When tare is in use, the tolerance values are applied from the tare zero reference; the tolerance values apply to certified test loads only.

T.2.2. Type Evaluation Examinations. - For type evaluation examinations, the tolerance values apply to increasing and decreasing load tests within the temperature~~,~~ **and** power supply~~, and barometric pressure~~ limits specified in T.7. **Influence Factors.**
(Amended 2004)

T.2.3. Multiple Range and Multi-Interval Automatic Weighing System. - For multiple range and multi-interval devices, the tolerance values are based on the value of the scale division of the range in use.

T.3. Tolerance Values.

T.3.1. Tolerance Values - Class III Weigh-Labeler. (See Section T.3.2. Class IIIS Weigh-Labelers)

T.3.1.1. ~~Static~~ Non-automatic Tests. - Tolerance values shall be as specified in Table T.3. Class III - Tolerances in Divisions.
(Amended 2004)

T.3.1.2. ~~Dynamic~~Automatic Tests. - Acceptance tolerance values shall be the same as maintenance tolerance values specified in Table T.3., Class III - Tolerances in Divisions.
(Amended 2004)

Table T.3. Class III - Tolerance in Divisions (~~d~~e)		
Test Load in Divisions	**Tolerance in Divisions**	
Class III	**Acceptance**	**Maintenance**
0 - 500	± 0.5	± 1
501 - 2000	± 1	± 2
2001 - 4000	± 1.5	± 3
4001 +	± 2.5	± 5

T.3.2. Tolerance Values - Class IIIS Weigh-labelers in Package Shipping Applications.
(Added 1997)

T.3.2.1. ~~Static~~ Non-automatic Tests. - Tolerance values shall be as specified in Table T.3.2.1. ~~**Static**~~ **Non-automatic** Tolerances for Class IIIS Weigh-labelers.
(Amended 2004)

T.3.2.2. ~~Dynamic~~Automatic Tests. - Tolerance values specified in Table T.3.2.2. ~~**Dynamic**~~ **Automatic** Tolerances for Class IIIS Weigh-labelers shall be applied.
(Amended 2004)

Table T.3.2.1. ~~Static~~ Non-automatic Tolerance for Class IIIS Weigh-labelers		
Test Load in Divisions	**Tolerance in Divisions**	
Class IIIS	**Acceptance**	**Maintenance**
0 - 50	± 0.5	± 1
51 - 200	± 1	± 2
201 - 1000	± 1.5	± 3

(Added 1997) **(Amended 2004)**

Table T.3.2.2. ~~Dynamic~~Automatic Tolerance for Class IIIS Weigh-labelers		
Test Load in Divisions	**Tolerance in Divisions**	
Class IIIS	**Acceptance**	**Maintenance**
0 - 50	± 1.5	± 2
51 - 20	± 2	± 3
201 - 1000	± 2.5	± 4

(Added 1997) **(Amended 2004)**

T.3.3. Tolerance Values. - Automatic Checkweighers.

T.3.3.1. Laboratory Tests for Automatic Checkweighers.

T.3.3.1.1. ~~Static~~Non-automatic Tests. - The acceptance tolerance values specified in Table T.3., Class III-Tolerances in Divisions, shall be applied.
(Amended 2004)

T.3.3.1.2. ~~Dynamic~~Automatic Tests.

(a) The systematic error for each test run must be within the acceptance tolerances for the test loads as specified in Table N**. ~~3.2.~~ 1.5.**

(b) The standard deviation of the results shall not exceed one-ninth (1/9) of the Maximum Allowable Variation (MAV) for specific package weights (3 standard deviations cannot exceed one-third (1/3) of the MAV value) as required in the ~~4th~~ **current** Edition of NIST Handbook 133. This value does not change regardless of whether acceptance, or maintenance tolerances are being applied to the device under test.
(Amended 2004)

(i) For U.S. Department of Agriculture (USDA) inspected meat and poultry products packaged at a plant subject to inspection by the USDA Food Safety and Inspection Service, use Handbook 133 Table 2-9, U.S. Department of Agriculture, Meat and Poultry, Groups and Lower Limits for Individual Packages, or

(ii) for all other packages with a labeled net quantity in terms of weight use Handbook 133 Table 2-5, Maximum Allowable Variations for Packages Labeled by Weight.

(iii) For all packages with a labeled net quantity in terms of liquid or dry volume use Handbook 133 Table 2-6, Maximum Allowable Variations for Packages Labeled by Liquid or Dry Volume.

(Amended 2004)

T.3.3.2. Field Tests for Automatic Checkweighers.

T.3.3.2.1. ~~Static~~Non-automatic Test Tolerances. - The tolerance values shall be as specified in Table T.3., Class III-Tolerances in Divisions.

T.3.3.2.2. ~~Dynamic~~Automatic Test Tolerances. -

(a) The systematic error requirement is not applied in a field test.

(b) The standard deviation of the test results shall not exceed one-ninth (1/9) of the Maximum Allowable Variation (MAV) for specific package weights (3 standard deviations cannot exceed one-third (1/3) of the MAV value) as required in the ~~4th~~ **current** Edition of NIST Handbook 133.

This value does not change regardless of whether acceptance or maintenance tolerances are being applied to the device under test.

(i) For U.S. Department of Agriculture (USDA) inspected meat and poultry products packaged at a plant subject to inspection by the USDA Food Safety and Inspection Service, use Handbook 133 Table 2-9, U.S. Department of Agriculture, Meat and Poultry, Groups and Lower Limits for Individual Packages, or

(ii) For all other packages with a labeled net quantity in terms of weight use Handbook 133 Table 2-5, Maximum Allowable Variations for Packages Labeled by Weight.

(iii) For all packages with a labeled net quantity in terms of liquid or dry volume use Handbook 133 Table 2-6. Maximum Allowable Variations for Packages Labeled by Liquid or Dry Volume.

(Amended 2004)

T.4. Agreement of Indications. - In the case of a weighing system equipped with more than one indicating element or indicating element and recording element combination, the difference in the weight value indications of any load shall not be greater than the absolute value of the applicable tolerance for that load, and shall be within tolerance limits.

T.5. Repeatability. - The results obtained from several weighings of the same load under reasonably ~~**static**~~ **constant** test conditions shall agree within the absolute value of the maintenance tolerance for that load, and shall be within applicable tolerances.
(Amended 2004)

T.6. Discrimination. - A test load equivalent to 1.4 d shall cause a change in the indicated or recorded value of at least 2.0 d. This requires the zone of uncertainty to be not greater than 0.3 d (See N. ~~3~~**2**.1.4.)

T.7. Influence Factors. - The following factors are applicable to tests conducted under controlled conditions only.

T.7.1. Temperature. - Devices shall satisfy the tolerance requirements under the following temperature conditions:

T.7.1.1. - If not specified in the operating instructions or if not marked on the device, the temperature limits shall be: -10 °C to 40 °C (14 °F to 104 °F).

T.7.1.2. - If temperature limits are specified for the device, the range shall be at least 30 °C (54 °F).

T.7.1.3. Temperature Effect on Zero-Load Balance. - The zero-load indication shall not vary by more than one division per 5 °C (9 °F) change in temperature.

T.7.1.4. Operating Temperature. - The indicating or recording element shall not display nor record any usable values until the operating temperature necessary for accurate weighing and a stable zero balance condition have been attained.

~~**T.7.2. Barometric Pressure. - The zero indication shall not vary by more than one division for a change in barometric pressure of 1 kPa over the total barometric pressure range of 95 kPa to 105 kPa (28 in to 31 in of Hg).**~~

T.7. ~~3~~**2. Electric Power Supply.**

~~**T.7.2****3.1. Power Supply, Voltage and Frequency.**~~

(a) ~~**Alternating Current.**~~ **Automatic weighing systems that operate using alternating current must perform within the conditions defined in paragraphs T3. through T.7., inclusive, from –15 % to +10 % of the marked nominal line voltage(s) at 60 Hz, or the voltage range marked by the manufacturer, at 60 Hz.**~~**Weighing devices that operate using alternating current must perform within the conditions defined in paragraphs T.3. through T.7., inclusive, over the line voltage range of 100 V to 130 V or 200 V to 250 V rms as appropriate, and over the frequency range of 59.5 Hz to 60.5 Hz.**~~

(b) Automatic weighing systems that operate using DC current must perform within the conditions defined in paragraphs T3. through T.7., inclusive, from minimum operating voltage to + 20 % of the voltage marked on the instrument (nominal voltage).

(c) Battery-operated electronic automatic weighing systems with external or plug-in power supply (AC or DC) shall either continue to function correctly or not indicate any weight values if the voltage is below the manufacturer's specified value, the latter being larger or equal to the minimum operating voltage.

Note: The minimum operating voltage is defined as the lowest possible operating voltage before the automatic weighing no longer indicates or records weight values.

Note: This requirement applies only to metrologically significant voltage supplies.
(Amended 2001)

~~**Battery. – Battery operated instruments shall not indicate nor record values outside the applicable tolerance limits when battery power output is excessive or deficient.**~~
(Amended 2004)

T.7.~~3.~~2.1. Power Interruption. - A power interruption shall not cause an indicating or recording element to display or record any values outside the applicable tolerance limits.

T.8. Radio Frequency Interference (RFI) and Other Electromagnetic Interference Susceptibility. - The difference between the weight indication with the disturbance and the weight indication without the disturbance **(see also N.1.4.)** shall not exceed one scale division (d) or the equipment shall:

(a) blank the indication, or

(b) provide an error message, or

(c) the indication shall be so completely unstable that it could not be interpreted, or transmitted into memory or to a recording element, as a correct measurement value.

(Amended 2004)

UR. User Requirements

UR.1. Selection Requirements. - Equipment shall be suitable for the service in which it is used with respect to elements of its design, including but not limited to, its capacity, number of scale divisions, value of the scale division or verification scale division, minimum capacity, and computing capability.

UR.1.1. General. - Automatic Weighing Systems shall be designated by the manufacturer for that service.

UR.1.2. Value of the Indicated and Recorded Scale Division. - The value of the division as recorded shall be the same as the division value indicated.

UR.2. Installation Requirements.

UR.2.1. Protection From Environmental Factors. - The indicating elements, the lever system or load cells, and the load-receiving element of a permanently installed scale, and the indicating elements of a scale not intended to be permanently installed, shall be adequately protected from environmental factors such as wind, weather, and RFI that may adversely affect the operation or performance of the device.

UR.2.2. Foundation, Supports, and Clearance. - The foundation and supports of any scale installed in a fixed location shall be such as to provide strength, rigidity, and permanence of all components, and clearance shall be provided around all live parts to the extent that no contacts may result when the load-receiving element is empty, nor throughout the weighing range of the scale.

UR.2.3. Entry and Departure From Weighing Area. - The belt or other conveyance that introduces the weighed load to the weighing zone and that carries the weighed load away from the weighing zone shall be maintained per the manufacturers recommendations.

UR.3. Use Requirements.

UR.3.1. Minimum Load. - The minimum load shall be as specified by the manufacturer, but not less than 20 divisions since the use of a device to weigh light loads is likely to result in relatively large errors.

UR.3.1.1. Minimum Load for Class IIIS Weigh-labelers. - The minimum load shall be as specified by the manufacturer, but not less than 10 divisions since the use of a device to weigh light loads is likely to result in relatively large errors.
(Added 1997)

UR.3.2. Maximum Load. - An automatic weighing system shall not be used to weigh a load of more than ~~the~~**its** maximum capacity ~~**of the automatic weighing system**~~**.**
(Amended 2004)

UR.3.3. Special Designs. - An automatic weighing system designed and marked for a special application shall not be used for other than its intended purpose.

UR.3.4. Use of Manual Gross Weight Entries. - Manual entries are permitted only when a device or system is generating labels for standard weight packages.

UR.4. Maintenance Requirements.

UR.4.1. Balance Condition. - If an automatic weighing system is equipped with a zero-load display, the zero-load adjustment of an automatic weighing system shall be maintained so that the device indicates or records a zerobalance condition.

UR.4.2. Level Condition. - If an automatic weighing system is equipped with a level-condition indicator, the automatic weighing system shall be maintained in level.

UR.4.3. Automatic Weighing System Modification. - The length or the width of the load-receiving element of an automatic weighing system shall not be increased beyond the manufacturer's design dimension, nor shall the capacity of an automatic weighing system be increased beyond its design capacity by replacing or modifying the original primary indicating or recording element with one of a higher capacity, except when the modification has been approved by competent engineering authority, preferably that of the engineering department of the manufacturer of the automatic weighing system, and by the weights and measures authority having jurisdiction over the automatic weighing system.

D. Definitions

automatic gravimetric filling machine (instrument). - A filling machine or instrument that fills containers or packages with predetermined and virtually constant mass of product from bulk by automatic weighing, and which comprises essentially an automatic feeding device or devices associates with one or more weighing units and the appropriate discharge devices.
(Added 2004)

automatic checkweigher. - A**n** ~~**dynamic**~~ automatic weighing system **that does not require the intervention of an operator during the weighing process** used to subdivide items of different weights into one or more subgroups, such as identifying packages that have acceptable or unacceptable fill levels **according to the value of the difference between their weight and a pre-determined set point.** These systems may be used to fill standard packages for compliance with net weight requirements.
(Amended 2004)

automatic weighing system (AWS). - An automatic weighing system is a weighing device that, in combination with other hardware and/or software components, automatically weighs discrete items **and that does not require the intervention of an operator during the weighing process.** Examples include, but are not limited to, weigh-labelers and checkweighers.
(Amended 2004)

non-automatic checkweigher. - **A weighing instrument, that requires the intervention of an operator during the weighing process, used to subdivide items of different weights into one or more subgroups, such as identifying packages that have acceptable or unacceptable fill levels according to the value of the difference between their weight and a pre-determined set point.**

Notes: Determining the weighing result includes any intelligent action of the operator that affects the result, such as deciding and taking an action when an indication is stable or adjusting the weight of the weighed load.

Deciding that the weighing result is acceptable means - making a decision regarding the acceptance of each weighing result on observing the indication or releasing a print out. The weighing process allows the operator to take an action which influences the weighing result in the case where the weighing result is not acceptable.
(Added 2004)

non-automatic weighing system. A weighing instrument or system that requires the intervention of an operator during the weighing process to determine the weighing result or to decide that it is acceptable.

Notes: Determining the weighing result includes any intelligent action of the operator that affects the result, such as deciding and taking an action when an indication is stable or adjusting the weight of the weighed load.

Deciding that the weighing result is acceptable means - making a decision regarding the acceptance of each weighing result on observing the indication or releasing a print out. The weighing process allows the operator to take an action which influences the weighing result in the case where the weighing result is not acceptable.
(Added 2004)

package rate. - PPM - Packages per minute.

random error(s). - The sample standard deviation of the error (indicated values) for a number of consecutive automatic weighings of a load, or loads, passed over the load receptor, shall be expressed mathematically as:

$$s = \sqrt{\frac{1}{n-1}\sum\left(x_i - \bar{X}\right)^2} \text{ or } s = \sqrt{\frac{1}{n-1}\left(\sum x_i^2 - \frac{\left(\sum X_i\right)^2}{n}\right)}$$

where: x = error of a load indication
n = the number of loads

systematic (average) error $(\bar{x})$ **. -** The mean value of the error (of indication) for a number of consecutive automatic weighings of a load, or loads, passed over the load receiving element (e.g., weigh-table), shall be expressed mathematically as:

$$\bar{X} = \frac{\sum x}{n}$$ where: x = error of a load indication
n = the number of loads

test puck. – A metal**, ~~or~~** plastic**, or other suitable** object **that remains stable for the duration of the test, ~~object~~** used **as a test load** to simulate a package. Pucks can be made in a variety of dimensions and have different weights to represent a wide range of package sizes. Metal versions may be covered with rubber cushions to eliminate the possibility of damage to weighing and handling equipment. The puck mass is adjusted to **~~specific~~ an** accuracy **specified in N.1.2.Accuracy of Test Pucks or Packages ~~so that pucks can be used to conduct performance tests~~**.
(Amended 2004)

weigh-labeler. - An automatic weighing system that determines the weight of a package and prints a label or other document bearing a weight declaration for each discrete item (usually a label also includes unit and total price declarations). **~~Typically, this type of weighing system determines the weight of packages dynamically, but may also include a scale that is incorporated in a conveyor system that weighs packages in a static weighing mode~~**. Weigh-labelers are sometimes used to weigh and label standard and random packages (also called "Prepackaging Scales").
(Amended 2004)